

FARM KNOWLEDGE



FARM ANIMALS

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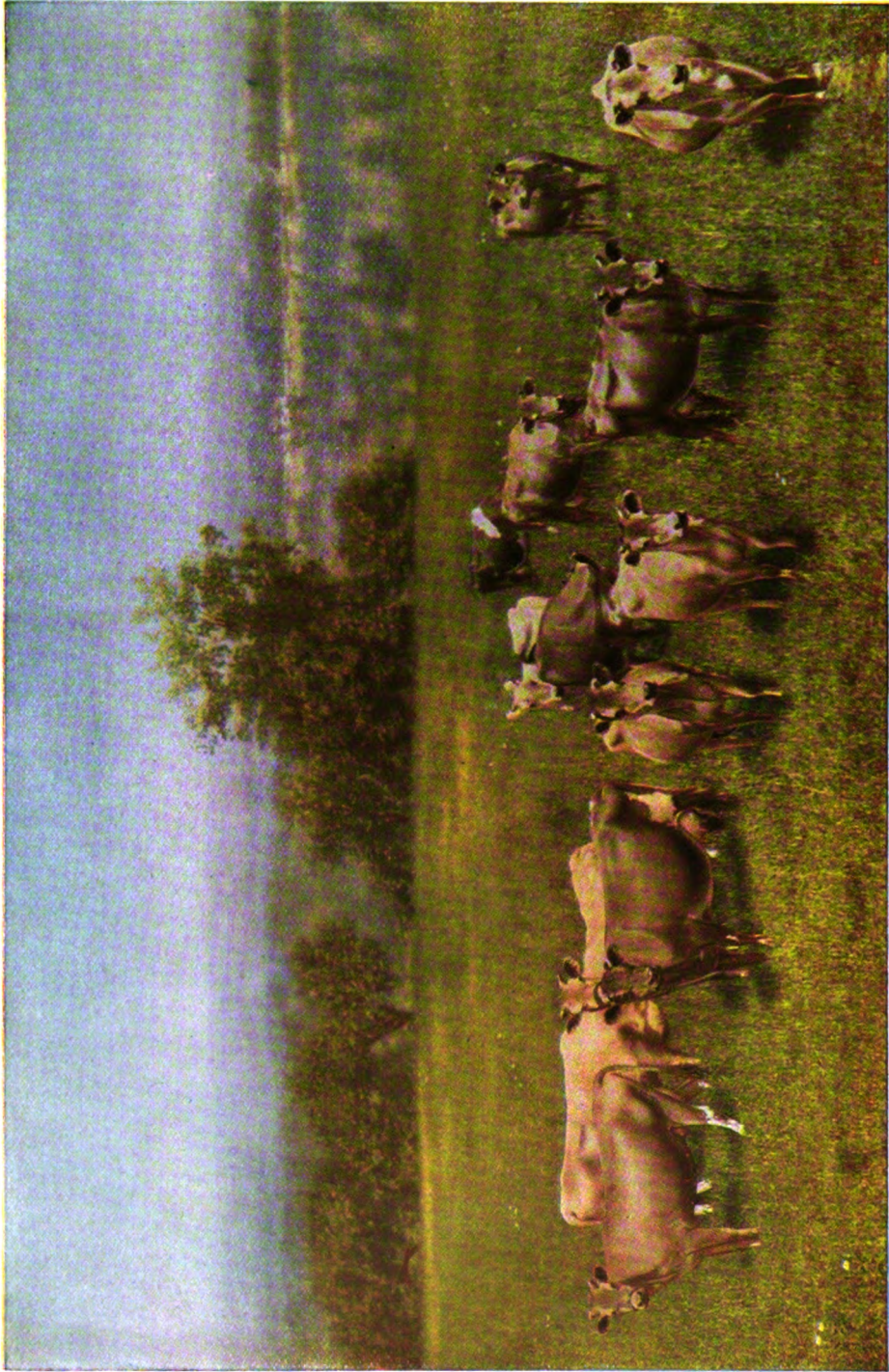
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FARM KNOWLEDGE



LIVESTOCK has been the fundamental factor in agriculture since the beginnings of the world, when man first became a farmer. In beauty, in usefulness and in vital importance as measured by human needs, the dairy cow—the most highly specialized and developed of farm animals—stands as a fitting representative of them all.

FARM KNOWLEDGE

*A Complete Manual of Farm Management, Written
by Recognized Authorities on the Principles
of the Country, and the Principles and the
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Real Farming of the Country
Own Copy of the*

E. L. D. SEARS, R. P. & CO.

IN FOUR VOLUMES

VOLUME I. FARM ANIMALS

The Practical Care and Management of Horses, Cattle,
Sheep, Swine, and Poultry in the Farm and the
Other Farm Animals: Animal Products and How
to Make Them

PREPARED EXCLUSIVELY FOR
SEARS, ROEBUCK AND CO.

BY
DOUBLEDAY, PAGE & COMPANY
GARDEN CITY NEW YORK



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A Complete Manual of Successful Farming Written by Recognized Authorities in All Parts of the Country; Based on Sound Principles and the Actual Experience of Real Farmers—"The Farmer's Own Cyclopedia"

EDITED BY
E. L. D. SEYMOUR, B. S. A.

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Revised Edition, 1919

FARM KNOWLEDGE

VOLUME I. FARM ANIMALS

CONTENTS

	PAGE
List of Full Page Illustrations.	vii
List of Authors	ix
Preface: What This Book Is and Why We Made It	xv
PART I. FARM ANIMALS: THEIR MANAGEMENT IN HEALTH	3-260
SECTION 1. HORSES	3-48
CHAPTER 1. How to Care for the Farm Work Horse	5
CHAPTER 2. Practical Horse Breeding	14
CHAPTER 3. Training and Fitting Horses	22
CHAPTER 4. Types and Breeds of Horses	31
SECTION 2. CATTLE	49-89
CHAPTER 5. The Care of the Dairy Herd	49
CHAPTER 6. Systems of Beef Production in America	59
CHAPTER 7. Dual Purpose Cattle	69
CHAPTER 8. Types and Breeds of Cattle	74
SECTION 3. SHEEP AND GOATS	90-131
CHAPTER 9. Sheep Raising—The Farm Flock	90
CHAPTER 10. Sheep Raising—Range Management	98
CHAPTER 11. Types and Breeds of Sheep.	110
CHAPTER 12. Goats and Goat Raising	122
SECTION 4. SWINE	132-153
CHAPTER 13. How to Raise Hogs	132
CHAPTER 14. Types and Breeds of Swine.	144
SECTION 5. OTHER FARM ANIMALS	154-186
CHAPTER 15. The Dog on the Farm	154
CHAPTER 16. Raising Wild Animals on the Farm	165
CHAPTER 17. Water Farming	175

	PAGE
SECTION 6. POULTRY AND BIRDS	187-258
CHAPTER 18. The Care of the Farm Flock	187
CHAPTER 19. Commercial Poultry Production	197
CHAPTER 20. Poultry Breeds and Principles of Breeding	206
CHAPTER 21. Turkeys and Turkey Raising	218
CHAPTER 22. Ducks and Geese and How to Raise Them	225
CHAPTER 23. Pigeon Raising and Squab Production	231
CHAPTER 24. Birds on the Farm	239
CHAPTER 25. The Cultivation of Game Birds	252
PART II. FARM ANIMALS: THEIR CARE IN SICKNESS	261
SECTION I. COMMON DISEASES	261-388
CHAPTER 26. Common Diseases of the Horse	262
CHAPTER 27. Common Diseases of Cattle	290
CHAPTER 28. Common Diseases of Sheep	315
CHAPTER 29. Common Diseases of Swine	326
CHAPTER 30. Common Diseases of Poultry	337
CHAPTER 31. Common Diseases of Dogs and Cats	351
CHAPTER 32. Drugs and Doses for Farm Use	361
CHAPTER 33. The Surgical Treatment of Farm Animals	374
SECTION 2. INFECTIOUS DISEASES.	389-432
CHAPTER 34. Tuberculosis	390
CHAPTER 35. Hog Cholera	399
CHAPTER 36. Contagious Abortion	406
CHAPTER 37. Foot-and-Mouth Disease (Apthous Fever)	412
CHAPTER 38. Texas Fever	419
CHAPTER 39. Glanders—Anthrax—Blackleg—Rabies	424
PART III. ANIMAL PRODUCTS	433-531
CHAPTER 40. Milk and Its Products	434
CHAPTER 41. The Care and Use of Milk on the Farm	448
CHAPTER 42. Commercial Dairying	458
CHAPTER 43. Butter Making on Farms and in Factories	466
CHAPTER 44. Cheese Making at the Farm and Factory	474
CHAPTER 45. The Farmer's Meat Supply	482
CHAPTER 46. Cured Meats and By-Products	496
CHAPTER 47. Handling Wool and Mohair on the Farm.	503
CHAPTER 48. How to Handle and Market Furs	510
CHAPTER 49. Beekeeping: Apiary Management	516
CHAPTER 50. Beekeeping: Honey Production	526
INDEX	533
APPENDIX	553

LIST OF FULL PAGE ILLUSTRATIONS

(See page 549 for index of text illustrations)

Since the beginnings of the world, when man first became a farmer, livestock has been the fundamental factor in agriculture. In beauty, in usefulness, in vital importance, as measured by human needs, the dairy cow—the most highly specialized and developed of farm animals—stands as a fitting representative of them all *Frontispiece (in color)*

	PAGE
Four ways in which the horse serves man	33
To be efficient, the work horse must be well sheltered, equipped, and cared for.	34
The leading three draft breeds in America	51
Three breeds of horses made in the United States.	52
Three foundation breeds of horses developed across the seas	85
Two strictly American products—the American jack and the mule	86
Foundation stones of success with cattle	103
The leading dairy breeds—I. Ayrshire and Guernsey.	104
The leading dairy breeds—II. Holstein-Friesian and Jersey	137
The leading beef breeds—I. Aberdeen-Angus and Galloway	138
The leading beef breeds—II. Hereford and Shorthorn	155
Three sources of meat for the nation	156
Sheep play two parts in American agriculture	189
Milk and Angora goats are steadily increasing in importance	190
Swine—one of the cornerstones of profitable farming	207
Livestock still wild, but which may yet be domesticated	208
Four ways in which the right kind of dog can serve the right kind of farmer	241
The leading utility breeds and varieties of poultry—I	242
The leading utility breeds and varieties of poultry—II	259

	PAGE
Poultry, like other livestock, can be raised as producers or as show material	260
Utility breeds for pigeon raising and squab production	293
Ducks and geese can always be raised as a farm sideline and sometimes as a commercial specialty	294
Birds as friends and foes; and the turkey industry	311
Prevention is more important—and often more effective—than cure, in the care of livestock diseases	312
Knowledge of the fowl's body, its parts and their operation is essential to successful farm doctoring	345
Dairying is dairying whether the herd is of one cow or a hundred	346
Cleanliness and sunlight are fundamental factors in successful dairying	363
For both producer and consumer buttermaking in the creamery is more profitable than buttermaking on the farm.	364
One of America's real opportunities in agriculture is the development of the cheese industry	397
The butchering of the nation's meat has been taken out of the farmer's hands but he can still profitably raise and dress his own supply	398
When every farm has its flock of sheep, the nation's wool crop will be more nearly what it can and should be	415
Beekeeping is a recreation, an art, and a profitable business that any farmer can afford to look into	416

AUTHORS OF VOLUME I

*A List of the Men Who Have Written This Volume, Together
With the Subjects on Which They Have Written, and the
Pages on Which Their Contributions Appear*

	PAGE
A. S. ALEXANDER, F. H. A. S., M. D. C., Professor of Veterinary Science, University of Wisconsin; Director, Division, of Horse Breeding, State Board of Agriculture.	
Common Diseases of the Horse	262
Common Diseases of Cattle	290
Common Diseases of Sheep	315
Common Diseases of Swine	327
Drugs and Doses for Farm Use	361
The Surgical Treatment of Farm Animals	374
ARTHUR A. ALLEN, A. B., Sigma Xi, Assistant Professor of Ornithology, Cornell University; Bird Editor, "American Forestry."	
Birds on the Farm	239
WILL C. BARNES, Assistant Forester, Branch of Grazing, United States Forest Service; author of "Western Grazing Grounds and Forest Ranges."	
Sheep Raising—Range Management	98
B. A. BEACH, D. V. M., Assistant Professor of Veterinary Science, University of Wisconsin.	
Common Diseases of Poultry	337
W. REID BLAIR, D. V. S., Veterinarian and Pathologist, New York Zoölogical Park; Professor of Comparative Pathology, Veterinary Department, New York University; Consulting Veterinarian, New York State Department of Agriculture; Member of State of New York Board of Veterinary Medical Examiners and of the American Veterinary Medical Association.	
Common Diseases of Dogs and Cats	351
Glanders	424
ROBERT BLASTOCK, Manager, Walnut Hall Farm, Donerail, Kentucky; President of the American Hampshire Sheep Association.	
Sheep Raising—The Farm Flock	90
DAVID L. BELDING, Biologist, Massachusetts Department of Fisheries and Game.	
Salt Water Farming	182
WILLIAM S. CORSA, Proprietor of Gregory Farms, White Hall, Illinois, and of a ranch in Nebraska. (Co-author with Frederick C. Minkler.)	
How to Raise Hogs	132

	PAGE
R. A. CRAIG, D.V.M., Professor of Veterinary Science, Purdue University; Chief Veterinarian, Indiana Agricultural Experiment Station.	
Hog Cholera	399
C. F. CURTIS, D.Sc., Dean of the Division of Agriculture, Iowa State College, and Director of the Iowa State Agricultural Experiment Station.	
United States Horse Industry Statistics	44
WALTER A. DYER, A.B., Farmer, Author, and Authority on Dogs; formerly Editor of <i>Country Life in America</i> . Author of "The Richer Life," "Pier- rot, Dog of Belgium," etc.	
The Dog on the Farm	154
O. E. DYSON, State Veterinarian of Illinois.	
Foot-and-Mouth Disease	412
C. H. ECKLES, B.S., M.Sc., Chief, Division of Dairy Husbandry, Uni- versity of Minnesota; author of "Dairy Cattle and Milk Production" and "Dairy Farming." Formerly Professor of Dairying, University of Missouri.	
The Care and Use of Milk on the Farm	448
G. C. EMBODY, Ph.D., Assistant Professor of Fish Culture, New York State College of Agriculture.	
Fresh Water Farming	176
E. H. FARRINGTON, B.S., M.S., Professor of Dairy Husbandry, University of Wisconsin; author of "Testing Milk and Its Products." Formerly Chemist, Connecticut Agricultural Experiment Station; in office of the Experiment Stations, United States Department of Agriculture, Wash- ington, D. C.; Chemist Illinois Agricultural Experiment Station; Chemist World's Fair Dairy Tests, Chicago, 1893; St. Louis, 1904.	
Milk and Its Products	434
F. F. FIELD, Proprietor of Dutchland Farms, Brockton, Mass., the home of King Ormsby Jane Rag Apple, the Holstein Bull, which, as a 5 months old calf sold for \$53,200.	
A Farmer's Plan for Fighting Tuberculosis	395
MARK FRANCIS, D.V.M., Professor of Veterinary Science, State Agricultural and Mechanical College of Texas, and Veterinarian, State Experiment Station; president of the Texas Veterinary Medical Association; orig- inated "Oil Dip" process for freeing cattle from parasites of the skin.	
Texas Fever	419
A. C. GAGE, Editor, "The Angora Journal. (Advisory author.)	
The Angora Goat	122
MERRITT W. HARPER, M.S., Professor of Animal Husbandry, New York State College of Agriculture; formerly Assistant in Agriculture, Uni- versity of Missouri and Assistant in Beef Production, United States De- partment of Agriculture. Author of "Manual of Farm Animals,"	

AUTHORS OF VOLUME I

xi
PAGE

"Practical Horse Training," "Animal Husbandry for Schools," "Management and Breeding of Horses," "Breeding Farm Animals."	
How to Care for the Farm Work Horse	5
Practical Horse Breeding	14
Training and Fitting Horses	22
L. L. HELLER, Assistant Secretary, National Wool Growers' Association. Formerly Associate Editor of "The Field Illustrated"; and Wool Expert, Bureau of Animal Industry, U. S. Department of Agriculture.	
The Angora Goat. (Advisory Author)	122
The Handling of Wool and Other Fleeces	503
REESE V. HICKS, Editor of "The Poultry Item" and Manager of Rancocas Farm, Brown's Mills, New Jersey.	
Principles of Poultry Breeding	213
ROBERT HERMAN, Superintendent of Laurelton Farms, Lakewood, New Jersey.	
Ducks and Geese and How to Raise Them	225
WINTHROP HOWLAND, Editor of the "Milk Goat Bulletin"; Member of the Board of Directors, American Milch Goat Record Association; Proprietor of Rancho El Chivar, Redlands, California. (Advisory author.)	
Milk Goats	127
K. C. IKELER, B.S.A., Professor of Animal Husbandry and in charge of Live Stock Management, Iowa State College; formerly of the United States Bureau of Animal Industry and Manager of Shorthorn herds on show circuits. (Co-author with W. H. Pew.)	
Systems of Beef Production in America	59
HERBERT K. JOB, A.B., Economic Ornithologist, National Association of Audubon Societies; formerly State Ornithologist of Connecticut and Member of the Faculty of the Connecticut Agricultural College. Member of American Ornithologists' Union. Author of "Among the Water Fowl," "Wild Wings," "The Sport of Bird Study," "How to Study Birds," "Blue Goose Chase," "The Propagation of Wild Birds."	
The Cultivation of Game Birds	252
ERNEST KELLY, in charge of Market Milk Investigations, Dairy Division, United States Department of Agriculture.	
Commercial Dairying	453
D. E. LANTZ, late Assistant Biologist, United States Department of Agriculture; member of Kansas Academy of Science, Biological Society of Washington, and of the American Ornithologists' Union; and writer, chiefly on Economic Habits of Mammals.	
Raising Wild Animals on the Farm	165
How to Handle and Market Furs	510
ROLLA C. LAWRY, B.S.A., Manager, Yesterlaid Egg Farms Company, Pacific, Mo.	
Commercial Poultry Production	197

FRED C. LOUNSBURY , practical milk goat breeder and Secretary of the International Nubian Milk Goat Association up to the time of his death in the spring of 1917. (Advisory author.)	
Milk Goats	127
T. F. MCGREW , Principal, Poultry Department, International Correspondence Schools, Scranton, Pa.	
The Care of the Farm Flock	187
Turkeys and Turkey Raising	218
FREDERICK C. MINKLER , B.S.A., Superintendent, Briar Cliff Farms, New York; agricultural author. Formerly Live Stock Commissioner of New Jersey; and Professor of Animal Husbandry, Rutgers College. (Co-author with W. S. Corsa.)	
How to Raise Hogs	132
VERANUS A. MOORE , V.S., M.D., Dean, New York State Veterinary College. Formerly engaged in Investigation of Infectious Diseases, Bureau of Animal Industry, United States Department of Agriculture; Chief of Division of Animal Pathology, United States Department of Agriculture; and Professor of Comparative Pathology, Bacteriology, and Meat Inspection, New York State Veterinary College. Author of "Laboratory Directions for Beginners in Bacteriology," "The Pathology and Differential Diagnosis of Infectious Diseases of Animals," "Principles of Microbiology," "Bovine Tuberculosis and Its Control."	
Tuberculosis	390
Rabies	431
M. MORTENSEN , B.S.A., Professor of Dairy Husbandry, Iowa State College.	
Butter Making on Farms and in Factories	466
H. D. PARKER , Portland, Oregon, Practical Goat Raiser. (Advisory author.)	
The Angora Goat	122
FRANK C. PELLETT , Practical Farmer and Professional Beekeeper; formerly Inspector of Apiaries, State of Iowa; author of "Productive Beekeeping."	
Beekeeping: Apiary Management	516
Beekeeping: Honey Production	526
W. H. PEW , B.S.A., farmer and stock raiser; member Executive Committee, Iowa Beef Breeders' Association; and judge of beef cattle. Formerly Chief, Department of Animal Husbandry, Iowa State College. (Co-author with K. C. Ikeler.)	
Systems of Beef Production in America	59
C. S. PLUMB , B.Sc., Professor of Animal Husbandry, Ohio State University. Formerly Associate Editor of the "Rural New Yorker"; first assistant, State Agricultural Experiment Station, Geneva, N. Y.; Professor of Agriculture, University of Tennessee and Assistant Director of the Tennessee Agricultural Experiment Station; Vice-Director and Director Indiana Agricultural Experiment Station; Professor of Agricultural Science and of Animal Husbandry and Dairying, Purdue University. Secretary and Treasurer of the American Kerry and Dexter Cattle Club,	

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United States Cattle Industry Statistics 74

P. B. RUGGLES, Practical Pigeon Breeder, Wyoming, Ohio.

Pigeon Raising and Squab Production. 231

J. L. SAMMIS, Ph.D., Associate Professor of Dairy Husbandry; University of Wisconsin.

Cheese Making at the Farm and Factory 474

Preparation of Rennet 501

F. S. SCHOENLEBER, M.S., D.V.S., M.D., Manhattan, Kansas; formerly Professor of Veterinary Science, Kansas Agricultural College.

Anthrax 428

THOMAS SHAW, late Professor of Animal Husbandry, Univ. of Minnesota; President American Milking Shorthorn Breeders' Association. Formerly Professor of Agriculture, Guelph Agricultural College; and Agricultural Expert for the Great Northern and Northern Pacific Railways. Author of "First Principles of Agriculture," "Weeds and Modes of Eradicating Them," "Forage Crops Other Than Grasses," "The Study of Breeds," "Sheep Husbandry in Minnesota," "Soiling Crops and the Silo," "Animal Breeding," "Clovers and How to Grow Them," "Feeding Farm Animals," "Management and Feeding of Cattle," "Dry Land Farming," "Management and Feeding of Sheep," etc.

Dual Purpose Cattle 69

W. H. TOMHAVE, B.S., Professor of Animal Husbandry, Pennsylvania State College, School of Agriculture.

The Farmer's Meat Supply 482

Cured Meats and By-Products 496

E. A. TROWBRIDGE, B.S., Professor of Animal Husbandry, University of Missouri.

Mule Production 21

F. H. VALENTINE, Agricultural and Poultry Editor, author, and practical poultryman. With Office of Information, U. S. Department of Agriculture.

Types and Breeds of Domestic Fowl 206

HUGH G. VAN PELT, B.S.A., Managing Editor, "Kimball's Dairy Farmer," and President, the Waterloo Jersey Farm.

The Care of the Dairy Herd 49

W. L. WILLIAMS, Professor of Veterinary Obstetrics and Research Professor of Diseases of Breeding Cattle, New York State Veterinary College. Formerly Assistant State Veterinarian of Illinois; Professor of Veterinary Science, Purdue University and of the Montana Agricultural College. Associate Editor of "American Veterinary Review"; editor for the United States of the "Veterinary Journal" of London; President of the Illinois State Veterinary Medical Association; and member of the New York State Veterinary Medical Society.

Contagious Abortion 406



PUBLISHERS' PREFACE •

WHAT THIS BOOK IS AND WHY WE MADE IT

THE successful farmer of to-day works with his brains as well as his hands. He is a reader and a thinker as well as a worker. But he is a busy man, too, and the books he reads must be practical, simple, direct and useful.

We have made FARM KNOWLEDGE to fit just those needs, to be the best and most complete thing of its kind. It is up to date in every way, yet it accepts and upholds every old-time method that has proved its value. It is, in short, a working guide to American farming that "looks toward to-morrow, remembers the lessons of yesterday, and talks about to-day." It has been written *for* farmers and their families, *about* farmers and their business, and *by* men whose lives and interests are closely bound up with the farm.

Our object in making it is to put in the hands of our customers and friends who are farming for their living, the most help and the best help that can possibly be put in book form, at a price that every one of them can afford. We hope and believe that it will help them to farm more successfully, raise bigger crops and better livestock, and sell them at a bigger profit. And in seeing and sharing the greater prosperity of our customers and the increased welfare of farmers in general, we will find our reward.

In making FARM KNOWLEDGE we have joined our forces with those of Doubleday, Page & Co., one of the biggest, most experienced, most successful publishing houses in the country. Its editors and experts are closely in touch with farming progress, and in making this book they have gone out to agricultural colleges, state and national departments of agriculture, farm bureaus, and their many farmer friends and advisors everywhere, for the solid, practical, time-tried rules and facts and figures with which these four volumes are filled.

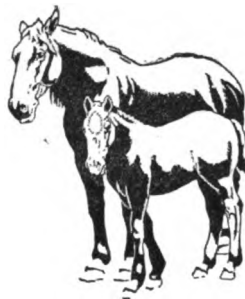
This is your *own* book—THE FARMER'S OWN CYCLOPEDIA. We want it to become a true friend and helper; a bond of closer friendship and greater service between you and—

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FARM KNOWLEDGE



FARM KNOWLEDGE



VOLUME I—PART I

Farm Animals: Their Management in Health

EVERY farm animal is more than just a horse, or a cow or a pig—it is also a machine, an engine. Like other engines it requires fuel—that is, food. And whatever fuel it does not need to build up and run its own body it changes into something of value to its owner. This new product may be work, such as hauling a wagon, dragging a plow or carrying a rider; it may be milk, eggs, meat, wool or some other staple that man needs; it may be colts or calves for building up the herd, or to sell; it may be the dog's effort in rounding up a flock of sheep or catching a woodchuck.

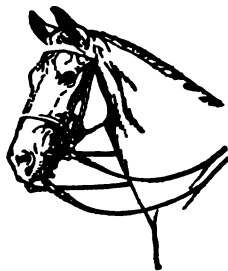
The farm animal is a better engine—a more efficient one—than any made by man. For while the steam engine gives out only 10 units of power for every 100 units of coal fed to it, the animal gives out 20 units for every 100 units of food it consumes. The rest, in the case of the machine is used in running it, and in overcoming the rubbing of tight parts, or goes up the chimney as smoke. In the animal, part of the lost power runs the heart and other organs and makes good the wear and tear of nerves and muscles; the rest passes off in the breath, sweat, etc.

Because the farm animal is a useful machine, and such a good one at that, it should be given plenty of care, of the right kind. Rest, kindness, good food, well-fitting harness, weather-tight barns, pure water, well-greased axles—these and many other details are just as effective and just as necessary for success with live stock as good gasoline for the automobile, oil in the bearings of mower or binder, or sharp edges on the cutter bar. The good farmer must be a good business man; the good business man knows the worth of insurance; and one of the best forms of insurance for the farmer to invest in is the care and intelligent management of those things on which his success depends—and none is more important than his animals.

This section of this book tells what the care of each kind of farm animal means and requires, and how to give that care most effectively and most economically. That is, it discusses first of all the practical details, the problems that most commonly confront the farmer. Matters mainly of reference value, such as the nature, types, uses, and importance of each kind of farm animal are given second place, where they can be looked up when the reader has more time or when he is in need of information of that particular sort.

All animals cannot be managed for best results according to one standard plan. They are individuals, each with its likes, dislikes, peculiarities, special needs, and special abilities. The more these individual traits can be taken into account the better. However, in all cases there are certain basic principles and practices which, if followed, lead toward success; their neglect leads toward almost certain failure. These principles and practices, as outlined in the following chapters, every farmer should know.





SECTION ONE

HORSES



CHAPTER 1

How to Care for the Farm Work Horse

By M. W. HARPER, professor of Animal Husbandry, New York State College of Agriculture, since 1905, and in charge of the University of Missouri farm for 3 years before that. His writings are well known to many farmers throughout the country. His ability to tell them what they want to know is based on, first, a thorough knowledge of principles; and second, a course of practical training on the farm, where he was born and lived until he took up the work he is now doing. At present he owns two small Ohio farms and a third interest in another and, with his father, operates the combined 400 acres.—EDITOR.

Feeding the Horse

THE usefulness of the work horse depends largely on its general care. Unfortunately, this fact is often overlooked and in an attempt to make up for insufficient or incorrect management in other directions the horse is given too much feed, which may shorten its useful career. It is far better to properly feed, stable, groom, bed, and protect it from the weather. Under such treatment it can keep in good condition and after a good night's rest take up each day's work with renewed vigor. Likewise properly fitted harness, careful shoeing, and intelligent driving enable the horse to apply its strength to the best advantage.

The great importance of the never-ending task of feeding is due, first, to the amount of labor involved. Except in mild climates and during seasons when the horse can be pastured much of the time, this is considerable, even when the horse is idle. Secondly, there is the cost of the feed which, though always important, varies with the kind used, the locality, the season, and the horse.

How to feed. The work horse must be fed regularly and uniformly at all times. He looks forward to the feeding hour and becomes nervous if it is long delayed. Further, irregular feeding, or rather, undue fasting, is often followed by rapid eating or overeating which in turn calls for excessive drinking with consequent digestive disorders.

Sudden changes in the kind of feed must be avoided as the work horse may not be able to adjust his digestive system to them at once, and may suffer digestive troubles from this cause. At least a week should be taken in making such a transfer.

Likewise the work horse becomes accustomed to a certain order of feeding which must be followed if its good health is to be maintained. To secure the most complete digestion and use of the feed, possibly the hay should be fed first and the grain last. On the other hand, the average horse is not satisfied and becomes very nervous and uneasy until fed its grain. Therefore, it is often of advantage to feed the grain and hay at about the same time, in which case the animal usually eats the grain first.

Time to feed. The work horse should be fed at least 3 times each day.

The morning meal may consist of from one fourth to one-third of the daily allowance and must be given at least an hour before going to work. After 4 or 5 hours of severe, or 5 or 6 hours of moderate work, the horse should be given the mid-day meal consisting of another fourth or third of the daily allowance, and at least an hour in which to consume it. After another 4 to 6 hour period of work, depending on its severity, the horse should be given the remainder of his day's allowance. Thus the heaviest feed comes at night when the horse has ample time to chew and digest the feed.

Amount of feed. The work horse should receive approximately 2½ pounds of feed daily for each 100 pounds live weight, the exact amount depending on the kind and severity of work as well as the kind of feed available. Of this amount, from one fourth to two thirds (depending upon the severity of work) should be grain and the remainder clean, sweet hay. If the work is hard increase the grain and diminish the hay; if light, lessen the amount of grain and increase the hay. If for any reason the horse is forced to stand idle in the stable for a few days, decrease the total amount of feed given; otherwise the animal will become "stocked" and his legs swollen and stiff. Azoturia (p. 150) sometimes follows heavy feeding and unaccustomed idleness.

Horses vary greatly as to the amount of feed they require. As an average daily ration for a 1,000-pound horse there may be suggested: 10 pounds of timothy or mixed hay and any one of the following grain combinations: (a) 11½ pounds of oats, (b) 10½ pounds of oats and corn or oats and barley, equal parts by weight, (c) 4 pounds brewer's grains and 8 pounds oats, (d) 8 pounds oats and 4 pounds wheat bran or (e) 5 pounds corn and 4½ pounds barley. Try to study the needs of each animal and to meet them by modifying the amount or nature of the ration.

What to feed. There are several hays or *forages* and grains or *concentrates*, that apparently are of equal value for feeding horses. The usefulness and economy of each depends upon the ease and cheapness with which it can be obtained in any particular locality.

Hay and Forage Crops

Hay and dry forage generally contain on the average about half the feeding value of grain, while succulent forage and pasture grasses contain only about a fourth the feeding value of grain. On most farms forage is much cheaper than grain and should be used as much as possible, although the working horse should always receive some grain in

addition. While there are a number of forages used as horse feed, only the more important and more common are discussed.

Timothy hay is the standard dry forage for feeding the horse and is the standard market hay, being comparatively free from dust when properly cured, it is relished by the horse as is no other dry forage, particularly if cut when in blossom or before. If not harvested until ripe it loses much of its value

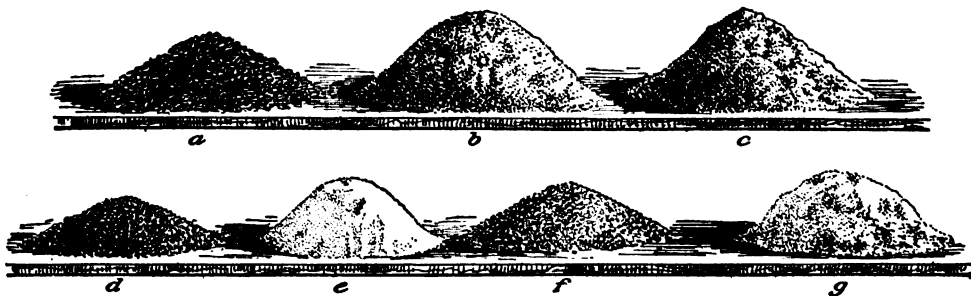


FIG. 1. The bulkiness of different rations. Each pile contains the same amount of digestible nutrients: a whole oats; b ground oats; c wheat bran, ground oats, and cornmeal, equal parts; d shelled corn; e cornmeal; f corn and oats, equal parts; g cornmeal and ground oats, equal parts

both as a horse feed and as market hay, since the percentage of crude fibre has already increased and much of the food value is lost in the little hard seeds which either shatter out or pass undigested through the digestive tract of the animal.

Clover hay is held in high esteem in some sections. It is rich in muscle-forming materials and mineral matter which commends it for young colts, especially if it is clean and bright. The clover stem is easily broken and the leaves easily crumble into dust making it difficult to cure the hay.

Alfalfa hay is fed to the horse extensively, particularly in the Western states. This also is rich in muscle-forming materials and mineral matter and makes a very good forage for growing colts. Horses are often very fond of it and it may be necessary to guard against their eating too much and suffering ill effects therefrom.

Corn stalks which have been cured in the shock are often fed as a substitute for hay and with very good results, especially in the fall before the nourishment has been leached out of the leaves by rain.

Cereal hays, especially oats and corn, and barley and oats, harvested and cured before the grains mature, are held in high esteem for horse feeding.

Corn silage has been fed to the horse with varying success. If of good quality and fed in moderate amounts, it may be given idle horses and growing colts with safety. Other succulent feeds such as pasture, or grass cut and fed green, are very good for the horse. They contain large quantities of water, however, and large amounts must be fed to provide the needed quantity of nutrients.

Grains and Other Concentrates

Grain is more costly than forage but in order to give the horse the proper nutrition without overtaxing its digestive organs, some grain must be fed. Most grains used in horse feeding are the seeds of cereal plants—oats, corn, barley, rye, and wheat—although in some cases only the by-product, such as the bran of wheat, is used.

Oats is the standard grain for horse feeding. Horses fed oats often show spirit that cannot be produced by any other grain. None is as safe for horse feeding as oats, the animal rarely being harmed if, by accident or otherwise, he is overfed. This safety is due to the hull which gives oats considerable bulk in

proportion to their weight; the ratio determines the quality of the grain and hence their feeding value. Neither musty nor new oats should be fed to horses.

Corn is ordinarily the cheapest of the cereals and the common grain for the horse in America. While much has been said against it as a horse feed, it is very palatable, digestible, and furnishes more energy than any other grain. Herein lies its danger, for if fed to excess it is likely to cause digestive disorders. Corn lacks mineral matter necessary for the proper development of young colts. Ground corn and oats mixed half-and-half makes a very good grain

feed for the work horse. The bulk of the oats overcomes in a measure the objectionable features of the corn, which adds food value.

Barley, rye, and wheat are sometimes fed to the horse, their use depending largely upon their market value. Usually they are worth more for other purposes.

Wheat bran is considered a very valuable addition to the grain ration. It has a good physical effect in that it tends to allay feverish conditions and is loosening on the bowels. It is too bulky to feed alone, especially to the work horse, but it is a good feed for growing colts and as a mash is used extensively, when it is fed each Saturday night.

Linseed meal, in limited quantities, is often fed to the work horse because of its physical effect. It stimulates the secretions, relaxes the bowels and gives the horse a smooth and glossy coat.

Molasses is used extensively as a horse feed, especially in the South. It is highly digestible and has a good physical effect, stimulating the secretions and keeping the hair fine and glossy.

Beans and peas are rich in mineral matter and muscle-forming materials and are sometimes used as horse feed, particularly in Europe.

Gluten meal and cottonseed meal are rich in oil and muscle-forming materials and are sometimes fed to horses, but cottonseed meal should not be fed to young colts.



FIG. 2. A handy compressed salt brick and its metal holder

Salting the work horse. Salt in *limited quantities* should be kept before the horse at all times but not placed in the food. If too freely supplied, some animals eat too much and develop an abnormal thirst; if then given free access to water they may develop digestive disorders.

Watering the horse. The order of supplying feed and water deserves careful consideration. Many persons believe that the horse should be watered

before feeding, while others claim that the feeding should precede the watering. This difference of opinion is probably due to the fact that either method sometimes results in digestive disorders. Thus, if the horse is thirsty and permitted to drink before feeding he may drink to excess with injurious results; moreover, this excessive drinking before feeding will affect the appetite and the horse will not consume as much feed as he otherwise would. On the other hand, if the water is withheld from the thirsty horse until after feeding he may not eat heartily and when finally given access to water may drink so much as to lessen his usefulness at work and even bring on digestive troubles.

To avoid such troubles the work horse should be watered so frequently that he will not become over thirsty and drink to excess—say at least 4 times a day: after the morning meal, before and after the mid-day meal, and before the evening meal. Possibly even better results would come from watering him after the evening meal as well as during the forenoon and afternoon, especially on warm days when he sweats profusely. When the horse is warm, take care not to let him drink too rapidly at first.

Care of the Horse

The horse is an energetic animal and the lighter types are rather high strung, hence it is important to be gentle and kind to him at all times. Rough handling uses up his nervous energy and lessens his usefulness. To secure best results the horse must not be overworked—neither must he be worked too long without rest and feed, nor worked too severely. If the work horse must stand idle a few days it is equally important that he be given exercise regularly.

The horse stable. The horse barn should be planned to meet local conditions such as the climate, the needs of the farm and the convenience of the farmer. No one type is best for all conditions; the Northern farmer needs one kind, the Southern another and the Western still another; the barn best suited for a small farm would prove inadequate for a large place. For this reason only a few of the more important essentials in stable construction are considered here (see Vol. III for plans and other details).

In choosing the location, be sure there is good natural drainage. Muddy barnyards are both inconvenient and unhealthful. If possible select an elevated site with a sandy or

gravelly loam soil from which water drains freely.

The comfort of the horse as well as his general health call for sufficient light and proper ventilation in the stable. Fresh air is essential for the well being of the hard working horse. Sunlight is nature's disinfectant and in its presence germ disease is not likely to occur. Except in very severe climates, light and ventilation may be obtained by means of windows cut long from top to bottom to admit more direct sunlight. They should be hinged near the centre, allowing the top to open inward so as to provide good circulation of air and prevent direct draughts.

In building a horse barn plan for ease and convenience in feeding the animals, cleaning the barn, and doing any other chores. Install as many labor saving devices as possible, such as feed and manure carriers, hay loading machinery, grain and hay chutes, etc. Put them where they will be most handy.

The straight or single stall economizes space, building materials, labor in caring for the animal and makes the lighting and ventilating problems easier. At the same time the horse gets greater comfort and safety from the box stall with its greater freedom.

Grain should be fed from a box and hay from a manger. The hay rack is objectionable, as the horse pulls the hay out, drops much of it under his feet and wastes it. Also the seed and chaff sometimes get into the

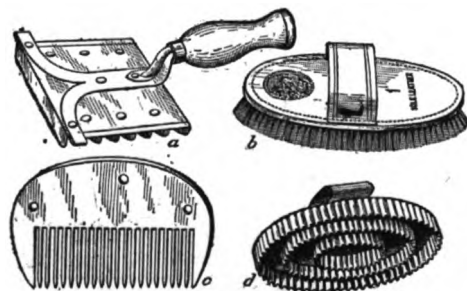


FIG. 3. Tools needed for grooming the horse: a and d two types of curry comb; b a common form of brush; c a comb for mane and tail

eyes and into the mane, making it hard to keep clean. The box should be large and flat bottomed so as to prevent the horse from eating too rapidly. The manger should slope inward at the bottom so as to prevent the animal from injuring his knees in fighting flies, and its bottom should be of open construction so that dirt may sift through and be removed when the stall is cleaned. All stable fixtures should be of metal or hard wood to prevent the horse from gnawing them.

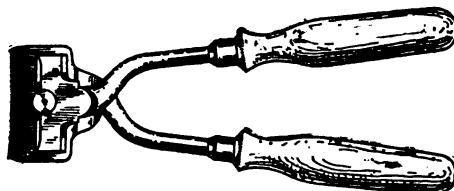


Fig. 4. Two-handed clippers for trimming the hair on horse's legs, mane, etc.

Grooming and brushing. The work horse should be thoroughly groomed and brushed each evening after the day's work is done, as well as in the morning. Rubbing and cleaning the skin stimulates the circulation thereby resting the tired animal and restoring vigor for the following day. Therefore grooming in the evening is even more important than the customary morning cleaning. If the horse's legs are muddy when he arrives at the stable it is well to clean them with a stiff broom. To make this easier, the hair may be kept clipped from the lower part of the leg; however, if this is done it is all the more important that the legs be cleaned and rubbed each evening, when the hoofs should also be examined and the clefts between the sole and the frog cleaned out.

Clipping. If the work horse has a long coat of hair he should be clipped, as this will prevent his getting very warm and thus lessen the likelihood of his catching cold. Clipping not only improves his appearance and makes it easier to clean him, but also seems to stimulate the general vitality, increase the appetite and general vigor, and produce greater efficiency. The profuse sweating of the long coated horse has just the opposite effect, lessening the vitality. However, clipping makes blanketing a necessity wherever the winters are severe; animals that can not be protected from the cold and wet should not be clipped.

Blanketing. In severe climates the use of blankets is desirable even if not absolutely necessary, for it increases the horse's efficiency and adds to his usefulness. The sweating horse cools rapidly when allowed to stand outdoors, and becomes nervous, then shivers or prances to keep warm, in either case using up nervous energy. To allow the work horse to cool off rapidly is very hard on him and may result in a chill. Likewise it is well to blanket the horse for the night after he has been groomed out, but he must be dry before the night blanket is put on, otherwise it will become damp and the hair remain so all night.

Bedding. Horse stalls should be cleaned each morning and the animal provided at night with a soft, dry bed of clean, sweet material as he then rests much more comfortably. Straw is preferred, but when high in price may be replaced by shavings, dry leaves, cornstalks, etc. Some persons prefer shavings as they leave an agreeable odor in the barn, but they make poorer manure.

Special care in winter. Most farm work comes during the growing season so that many horses are idle, or practically so, during the winter. In keeping idle horses through the winter it is more economical and often better to turn them into a small lot where there is some protection, such as a shed open to the south than to confine them too closely to the barn unless, of course, the climate is very severe. As winter comes on they will grow long coats of hair which will afford protection. Such horses can be maintained largely on dry forage but it is better to give

some grain too. They should be put to light work, and the grain ration increased some time before spring work starts, to put them in condition for severe work.

Special care in summer. Often it is desired to turn the farm work horse to pasture at night to save hay and the labor of cleaning the stall. When this practice is followed the horse should have the regular grain feed 3 times a day. Otherwise the tired horse must graze all night in order to get sufficient feed, and this robs him of his rest. He soon runs down in vitality and his

general efficiency decreases to a marked degree. When the work is severe it is a poor practice to turn the horse out at night. He should be comfortably stabled and fed on nutritious dry feed of a cooling nature, oats rather than corn; and a bran mash should be given each Saturday night to cleanse the digestive tract. If the horse sweats profusely he should surely be watered during the forenoon and afternoon. The use of a hat or shade over the head when the sun is very hot, is sometimes recommended. If used, a hat must be light and permit free circulation

of air; otherwise it may lessen rather than increase the horse's comfort.

Fly nets and insect pests. In summer when the flies are troublesome the use of fly-nets or fly blankets brings relief to the work horse. The leather affair is the most presentable and durable but the fly-blanket is used extensively and if kept clean and dry is cooler than the leather net. The horse should be provided with a throat latch cloth when botflies are present; these pests are very annoying and the horse in fighting them often becomes excited, uncontrollable and may break loose if hitched.

The Harness

It is by means of the harness that the horse accomplishes his work and that the driver tells him what he is to do. Therefore it must fit him comfortably and enable him to make full use of his power. A sore mouth produced by a poorly fitted bridle often excites the horse to run away; a sore shoulder produced by an illfitting collar often induces him to balk; and a sore tail produced by an improperly fitted crupper often provokes him to kick. To avoid such difficulties, each part of the harness should be perfectly fitted and carefully adjusted.

Adjusting the check rein. Unless restrained by a moderately loose check rein, the horse is likely to become careless in his habits, shambling in his gait, and yield to the temptation to eat grass, etc., when he is likely to get tangled in the

harness. The Kimball Jackson check rein often used on the driving horse, while very efficient, easily becomes an instrument of torture. If drawn too tightly it holds the horse's head so that he is unable to see the ground immediately in front of him and is likely to stumble on a rough road; it holds him in such a position that he cannot pull, especially in ascending a steep grade; it puts a severe strain on his back and fore legs in descending a grade; and it holds his neck in such an unnatural position that it soon becomes numb causing him to toss his head from side to side in search of relief. If used, this rein should be kept fairly loose. The average work horse is sufficiently controlled and not at all tormented by an ordinary side check also kept loose.

Fitting the collar. While a number of horse collars such as the steel, pneumatic, and humane types have been devised to meet varying conditions, the leather collar still holds first place generally. Because of the difference in the shapes of horses' necks, it is often necessary to adjust the collar to the neck of the horse that is to wear it so as to insure a perfect fit. To do this, take the poorly fitting collar, new or old, wrap it round and round with a thoroughly wet cloth and let it remain over night. In the morning adjust it snugly to the shoulders and neck by means of the hame straps and work the horse moderately during the day. The moist collar will adjust itself to the shoulders and the horse will seldom be troubled with sore shoulders or neck thereafter. Sweat pads may be used if the only available collar is too large, but they are very warm and the neck and shoulders can be kept in a more healthy condition without them.

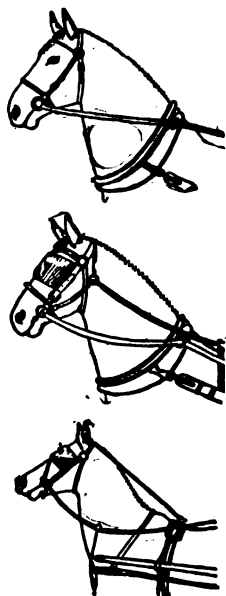


FIG. 5. The check rein used and abused. The upper figure carries his head naturally; the middle, one is restrained but not cramped by a side check; the bottom one is subjected to the torture of the overhead or bearing rein.

Care of harness. The bearing parts of the harness must be kept scrupulously clean at all times; this means careful inspection and thorough cleaning each morning before work, especially of the collar, sweat pads, when used, saddle and crupper. It is not possible to prevent sore shoulders, back, and tail if these parts are permitted to become coated with sweat, dandruff, and dirt. (See Vol. III, Chap. 3, The Use and Care of Farm Harness.)

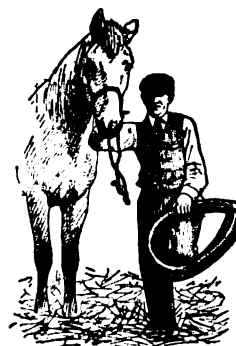


FIG. 6. Stretching a collar before putting it on

Care of the Feet

The importance of the foot calls for special attention throughout the horse's active career. The sole and clefts must be kept clean and free from foreign materials. Some hoofs have a tendency to dry out and become hard and brittle; they should be oiled with some good oil or hoof ointment to soften the wall and make it less likely to crack. In case a piece is broken from the side of the hoof the foot should be leveled with a rasp to prevent undue strain on the other side. If the horse is kept or worked on soft ground without shoes the hoofs must be kept trimmed.

The hoof grows approximately one-third of an inch a month, hind hoofs faster than fore hoofs and unshod ones faster than shod ones. Thus the toe grows down in about 10 months, the sides in 6 to 8 months, and the heel in 3 to 5 months, depending on the length of each part.

Shoeing. In some localities horses are seldom shod, in others only the front feet are shod, but in most parts of the United States the hard roads make it desirable if not indeed essential to keep the horse shod all around. The purpose of the shoe is to prevent excessive wear, give a secure foothold and prevent slipping on ice or mud. For heavy work use heavy shoes provided with large calks; for light work the shoes too may be lighter and often the calks are dispensed with. The smooth-shod horse slips more on ice and hard, smooth roads than if he were bare-footed.



FIG. 7. Keep the hoofs trimmed. A long toe strains the leg muscles just as it strains the arm to bend it forward when the fingers are extended as in A. If the toe is short and rounded, or the fingers clenched, as in B, there is no such strain.

In preparing the hoof for the shoe, keep the foot level, to prevent undue strain of the tendons and resulting injuries. Leave the frog normal in size and shape to serve as a cushion for the foot. In other words, first make the foot as nearly normal as possible, then make the shoe fit it.

The shoe should be fitted cold, not so hot as to burn the hoof when placed against it, as is so often the practice. In nailing do not start the nails too near the edge of the hoof, or they will have to be driven so high up into the wall to make them hold that the old holes will interfere when the shoe is reset. The nails

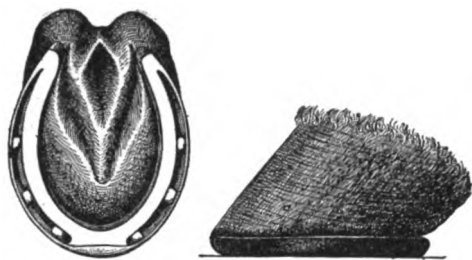


FIG. 8. A perfect foot and a perfectly fitting shoe from below and from the side

should be small and clinched in a small groove filed for the purpose, then smoothed with a rasp. Never rasp the outside of the hoof as this removes the natural protective covering, and permits the hoof to absorb water in the wet season, dry out during the dry season, and become hard and brittle.

Shoes for unsound feet. Many shoes designed to protect and strengthen the unsound foot often allay pain and prolong the usefulness of the horse, but many of them allow dirt and filth to collect under the protecting pad, thus calling for constant attention to prevent disease. To diminish the shock and prevent slipping, as well as noise, on the hard slippery pavements of our cities a number of rubber pads, rubber soles, fibre shoes and the like have been devised. While expensive, such shoes are often excellent for the purpose, but they, too, require constant attention to prevent the collection of filth.

Elementary Rules of Driving

The efficiency of the work horse is influenced to a very large degree by the driver. Many useful animals are made vicious and unsafe for life by rough handling. In the fields we often see the plow team dragging along the plowman, who has the lines about his body. Since the horses are pulling the man with their mouths, he is tiring and hindering rather than helping them. Likewise we often see the driver of a heavily loaded wagon holding the lines with extended arms and pulling on the horses' mouths with all his strength, while the already over-taxed team tugs at him as well as the load. Rough drivers often nag and jerk the lines constantly, thus annoying the team, while still others permit the lines to hang, leaving the team to stumble along as best it can.



Fig. 10. Rubber shoe pad for protecting the foot on hard roads.

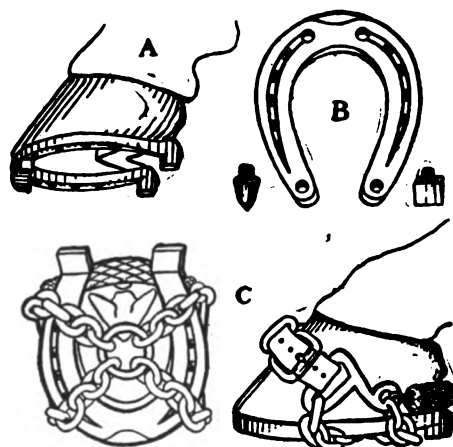


FIG. 9. Methods of shoeing for slippery weather: a common welded calks; b two forms of removable calk and shoe prepared for them; c chain calks commonly used on city pavements

The desired object in driving is to retain the natural sensitiveness of the animal's mouth so that he will be responsive to the slightest touch on the lines. Any method that will accomplish this is satisfactory and many excellent drivers employ different methods and hold the lines in various positions. In fact the method employed is often controlled by the kind of load, or the type of machinery to be handled, the plow calling for one style, the reaper another, and the corn planter still another. For road driving the most approved method of holding the lines is to take them in the left hand, the left line coming into the hand over the forefinger and the right one between the middle and ring finger. They may be manipulated slightly with the left hand, but the guiding is

'done with the right hand, the driver assuming a comfortable, natural position.

The pressure to be applied on the bit will depend on the type of driving and the horse, but should be sufficient to hold the horse steady and in position, neither more nor less. If the horse has been properly trained and bitted, the lightest touch on either line is all that is needed to guide him; likewise but little pressure is needed to tell him what he is expected to do. The horse thus driven is left free to apply all his attention and strength to the task in hand.

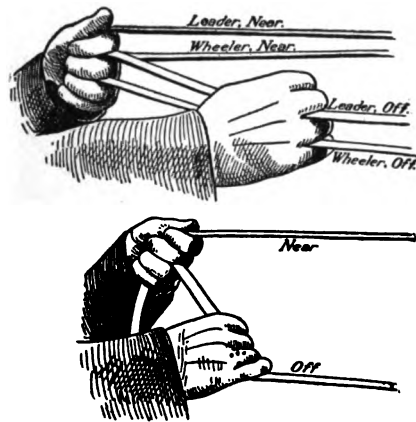


FIG. 11. A correct way to hold the reins in driving a 4-horse team (above) and a single horse or pair (below)



FIG. 12. A typical team of heavy farm horses; the kind it pays to raise

CHAPTER 2

Practical Horse Breeding

By PROFESSOR M. W. HARPER. The second stage in the ownership and care of horses, is the breeding of mares and the raising of colts. The principles upon which these activities are based are the same whether one mare or 50 are concerned. The man who raises and finishes horses for a particular market, for show ring competition or who works on a carload shipment scale, is a specialist, an expert; but the details of his work are the same as those of the owner of a single brood mare. It is just these details that Professor Harper takes up in this chapter.—EDITOR.

THE natural conditions of our country are ideal for breeding horses. This fact is emphasized by the manner in which horses given their freedom by the early settlers ran wild and bred, as well as by the success attained in breeding Thoroughbreds and trotters in New England and New York, saddle horses in Kentucky, Tennessee, and Missouri, and heavy drafters throughout many of the north central states. Likewise Missouri, Kentucky, and Tennessee together with the Southern states constitute the principal mule breeding section of the entire world.

Farm Types of Horses

The most profitable type or breed of horse to produce on the general farm will depend in part on attendant circumstances, there being no best type for all conditions. The class of work to be performed, the nature of the country, the local demand, and that in the nearest markets all help determine the value and economy of any particular type.

Kind to breed. The lighter types, therefore, belong on farms devoted to dairying,

fruit farming, market gardening, etc., where there is but little heavy work such as rough, deep plowing and heavy hauling to be performed. Further the need of making frequent deliveries to market or creamery requires light, active horses. Possibly the lighter types are also best suited to farming conditions in sections where the land is rough and broken.

On grain and stock farms, where much

plowing, hauling and other heavy work is to be done, the heavy type is more desirable. While such horses are not so active or stylish as the lighter types, they possess many advantages in regard to farm production. They can be raised with less risk as they are less active and less likely to injure themselves than the roadster or coacher; should a slight blemish occur it is not considered so seriously. Draft horses can be put to work younger; they do not require so much training to fit them for work or market; they are in constant demand for city traffic; they are the least affected by business depressions and the first to recover; and they are the least affected by automobiles, fads, and fashions.

Breed sound horses. Both stallion and mare should be free from all forms of unsoundness or disease that are likely to appear in the offspring. "Like begets like" is the first principle of breeding, and the unsound horse is a drag on any market, while good horses are practically always salable. Not a few breeders have fallen into the grievous way of patronizing the cheapest stallion available without regard to his breeding power, and considering any broken down, maimed, blind, or otherwise unsound mare fit for breeding purposes when no longer able to work. This practice has led to the production of many unprofitable horses.

When to breed. The natural breeding season for the mare is the spring of the year, at which time she conceives most readily. When so handled the foal comes when it is more easily managed, the weather is mild and the mare and foal may be turned to pasture. This is very good for a suckling foal, and in addition the foal has the run of the field and



FIG. 13. A team of light farm horses strong enough for light teaming and speedy enough for the road

gets proper exercise. Because of the spring work, however, it is inconvenient on many farms to breed the mare to foal at this season. This necessitates breeding her in the fall so as to have the foal come at that time. While the mare is not so likely to breed in the fall, due in part at least to her thin condition after the season's work, yet by feeding nutritious, rather laxative feed, by blanketing and giving regular, moderate work the desired results can often be attained. The object to be sought is to make the conditions as springlike as possible. While fall colts call for extra care during the winter, they make as good horses as foals dropped in the spring.

The Stallion

The stallion should be a good specimen of his type and breed and of known breeding qualities. For this reason middle aged stallions are preferable to young ones. Patronize purebred stallions showing distinct individuality. Pedigree alone does not guarantee a sire's worth, as many inferior animals find their way into the stud books. Therefore study conformation, quality, action, and temperament.

When to begin use. As it is important to know the breeding qualities of a young stallion he should be tested out at the earliest possible age. Thus at about 2 years of age he may be mated with a few—6 or 8—mares of known breeding qualities. Be sure that the breeding capacity of the mares is known, otherwise the qualities—good or bad—possessed by the offspring will be of uncertain origin and but little will be learned as to the worth of the sire. Do not let him mate more often than once every third day, and arrange that all the half dozen or so mares shall be mated within a month. It requires some skill to train the young sire to mount and serve a mare, hence for the first few times the stallion should be attended by an experienced horseman.

At 3 years of age the stallion may be mated with a larger number of mares of known breeding qualities but even at this age he should be restricted. He is not yet fully matured and his breeding qualities can not be known until his

first crop of colts have had time to develop sufficiently. The next year, however, he may be mated with a much larger number of mares, particularly if the first crop of colts indicates good breeding qualities. At 5 years of age he will be practically matured, when he may be mated every day during the breeding season.

Care during the breeding season. It is not considered advisable to mate a stallion with more than 2 mares a day, one in the morning and the other in the late afternoon or evening. Care in this respect will result in as many foals during the season as if more mares were mated daily. When the number of services each day is increased the number of germ cells rapidly decreases; if the services are repeated too frequently the germ cells become so reduced in number as to cause low fertility and often sterility during the period of excessive sexual use.

The aim in caring for the stallion is to so feed, groom, and exercise him as to maintain the highest vigor. Stallion owners like to have their animals very fat, in which condition they are more presentable. Thus the horse, heavily fed and denied sufficient exercise, often becomes loaded with fat, his muscles become soft and flabby and although he may seem in the pink of condition, he is not nearly so well fitted for service in the stud as he would be had he received plain food and been worked moderately each day.

During the breeding season (which in general may be said to extend from the first of March to the end of July, though it varies widely) sound oats and sweet timothy hay, or clover and timothy mixed, make a good feed. The grain may be varied from time to time by adding wheat, barley, hominy feed, and the like. Wheat bran has a good physical effect and should always be included. It is rich in mineral matter and protein, materials of special value for the breeding stallion. The feeding of a carrot now and then is also very beneficial.

Exercise the stallion regularly during the breeding season to improve his appetite, increase his strength and vigor, and thus improve his breeding powers.

Care when not in use. To insure good results the stallion should be worked regularly during the closed season and given a rather loosening ration. Nothing is better to keep him in good condition than a wheat bran mash 2 or 3 times a week.

Not infrequently the stallion is neglected during the closed season.

Confined to a box stall, he can not take sufficient exercise and often develops vicious habits that reduce his breeding power, make him difficult to control, and often increase the abuse he receives. Under such management an otherwise valuable breeding horse often becomes unsafe and practically useless.

Artificial breeding. In recent years much attention has been given to artificial breeding, a number of mechanical inseminators, such as capsules, syringes with long pistons and the like, having been developed. This method of breeding has a commercial value which is attractive to breeders. The process is comparatively simple. During the service the semen containing the germ cells is collected in a rubber pouch, then placed in a number of capsules and in this manner quickly injected



FIG. 14. A poor type of stallion for use on the farm. Note the coarse, heavy bone; large, unsound joints; poor standing position and excessive fatness due to an attempt to cover up his faults. His colts show poor conformation and soon become unsound.

into the uterus of one or more mares, care being taken to prevent exposure to strong sunlight. In other methods, the injection is accomplished with a syringe especially designed for the purpose. While the method has been widely advertised and some strong claims have been made regarding its efficiency, it is not practised to any extent by leading breeders, and probably not at all by farmers who breed but a few mares. However, since the stallion at each service discharges sufficient germ cells to impregnate a number of mares and since artificial impregnation is a simple operation, it may possibly be used to extend the productive power of valuable horses under favorable conditions.

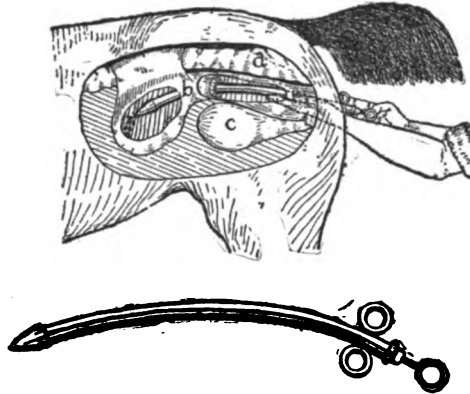


FIG. 15. An inseminator for artificial breeding and the way it is used: *a* rectum; *b* womb; *c* bladder

The Brood Mare

On general farms team work comes during the growing season and during the remainder of the year there is often insufficient work to meet the cost of keeping teams. On such farms horse breeding yields a good profit, as mares can be bred so as to raise their colts during the idle season.

Productive period. In the brood mare the most productive period is from 4 to 12 or 15 years of age, although this period may be extended both ways in exceptional cases. Occasionally a filly will breed freely at 2 years of age, thus bearing her first foal at 3, and occasionally a mare remains fully fertile till well along in the teens. While there is a difference of opinion as to the advisability of breeding the two-year-old filly, yet if she has matured early and is well developed there is no physical reason why she should not be bred, particularly if the offspring is to be used on the farm or fitted and sent to market. If purebred, possibly it would be better to wait until the mare is 3 years of age before breeding her. The old mare may be bred so long as she and her foals continue to do well. Mares usually come into breeding condition every 3 or 4 weeks, although the period differs with individuals and some mares do not show signs while nursing their foals.

Care of the pregnant mare. In all important essentials the care of the pregnant mare should be similar to that of other horses. Her work should be so regulated as to prevent her becoming tired, over-heated, or injured in any way. If proper care be taken she may safely be kept at ordinary farm work up to the day of foaling. Indeed such practice is preferable to close confinement in the stable with little opportunity to take exercise.

The feed should be such as to supply the mare's demands and in addition allow ample nourishment for the development of the foal, both before and for a short time after birth. Feeds rich in mineral matter, such as oats, bran, clover, and alfalfa are to be preferred. Thus the grain ration may consist of 5 parts ground oats, 4 parts wheat bran, and 1 part linseed meal with bright clover or alfalfa hay for roughage. The pregnant mare has a tendency to fatten as pregnancy advances. This must be guarded against, as excess fat may interfere with the proper development of the foal and cause difficulties at foaling time.

The gestation period. The period over which the mare carries her foal is exceedingly variable. It is popularly placed at 11 months, or more accurately, 340 days. However, in records of 582 pregnant mares the period ranged from 287 days for the shortest to 419 days for the longest, showing a variation of one third the average period. These figures may be considered the extremes for normal gestation in the mare.

Signs of parturition. Because of the uncertain length of the gestation period the mare should be watched closely for signs of approaching parturition. While the mare's udder becomes distended some time before foaling, the teats seldom fill out full and plump to the ends more than a week or 10 days before the foal is born. Much reliance is often placed upon the appearance at the ends of the teats of wax, which usually appears not earlier than 3 days before the foal comes and often within 24 hours. Another sign is the softening and relaxation of the muscles passing over the rump which causes a sinking of the croup. Just before foaling the lips of the vulva become somewhat thickened and stand apart more loosely than usual.

Preparation for foaling. The mare should be provided with a large, well lighted, well ventilated box stall from which all obstructions such as projecting mangers and feed boxes have been removed, and which has been well cleaned and freshly bedded with clean straw or shavings. A little air slaked lime should be scattered about the stall before the bedding is put down as a disinfectant to prevent infection, a common cause of loss among new-born foals. When possible, false walls should be constructed about the stall sloping upward and outward at an angle of about 45 degrees and joining the wall at a height of about 4 feet, to prevent the mare from injuring the foal during labor pains and birth.

When the weather permits the best place for the mare to foal is in an open grassy paddock where there is no danger of infection or injury. All other animals should be kept out of the lot at this time.

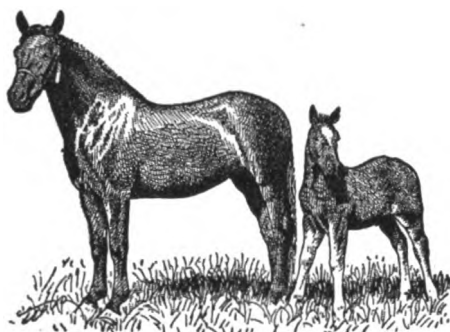


FIG. 16. A good farm brood mare and her foal, showing good form, quality, and vigor. Only with such a start can success be assured.

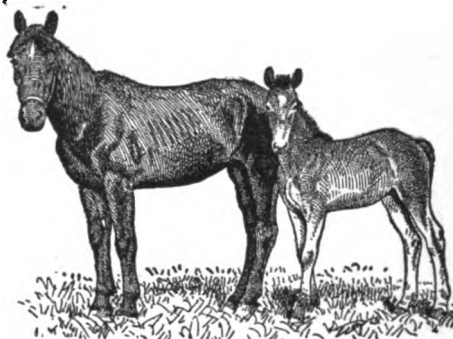


FIG. 17. A poor, unsound mare and her foal which looks good now, but which is almost sure to inherit her weaknesses and become an equally undesirable horse.

Care at foaling time. If birth is normal both mare and foal should be left alone; they will come through the ordeal safely. If, however, after a reasonable time the mare is unable to deliver the foal or if an examination reveals an abnormal presentation a skilled veterinarian should be consulted at once, as difficult parturition is likely to prove fatal to the foal.

To prevent infection disinfect the navel of the foal immediately after birth. A very good powder for this purpose may be made of equal parts desiccated alum, gum camphor, and starch freely powdered and thoroughly mixed. The navel should be powdered at half hour intervals for a time and then as needed till all danger of infection is past. It is imperative to tie the cord before cutting

it although it should neither be tied nor cut if such can be avoided.

Care of the mare. After foaling the mare should be given a drink of gruel made from a pound of fine oatmeal in half a bucket of lukewarm water. While she may have been worked moderately up to the previous day, she should now have a few days of rest, the length of time depending on her condition and that of the foal. If recovery has been satisfactory the mare may be put to light work in a week or 10 days.

The feed given the mare while nursing the foal should be such as to stimulate the production of milk. The ration suggested above for the pregnant mare (p. 17) is a good one though it could be improved by the addition of a succulent feed such as carrots. At best many mares are poor milkers and must be encouraged. Fresh pasture is one of the best aids to healthy development of both mare and foal.

The mare's udder requires constant attention during the first few weeks. If the foal does not take all of the milk, the udder distends rapidly and may cake and become so very sore that the mare will not permit the foal to nurse. In such case she should be partly milked by hand. In other cases the foal may obtain an over supply of milk resulting in loose bowels, in which cases, too, the mare should be partially milked by hand.

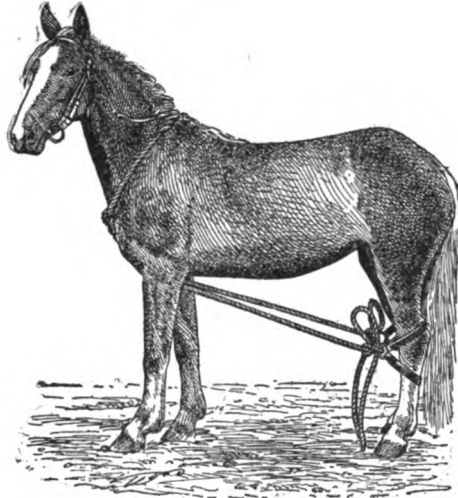


FIG. 18. Breeding hobbles in place on a mare

Breeding after foaling. The mare will usually show signs of breeding condition from 7 to 9 days after foaling. It is the common practice to breed her on the ninth day. She should be returned to the stallion in 3 weeks to see if she has conceived, in which case she will not receive him.

The Colt

When birth is normal the mare will usually tend the foal, which if bright and active needs only to be left alone. Not all foals are so fortunate and the breeder must be ready to give any help or attention required.

The foal's first meal. If for any reason the new-born foal is unable to get up and nurse within an hour after birth, it must be aided in securing its first meal. It is essential that the foal receive the first milk which is a natural purgative and serves to remove material that has accumulated in its digestive tract during the last few days of fetal development, and that must be gotten rid of promptly. This foremilk, or *colostrum*, is thick and yellow and is often drawn off as being unfit for the colt, a practice which may bring about constipation, often resulting in the death of the foal within 2 or 3 days.

Feeding the foal by hand. It often becomes necessary to raise the foal independent of the dam. In such cases the best substitute for the mare's milk is that of the cow. But since this contains less sugar and more fat than that of the mare it must be modified before giving it to the new-born foal. To do this, procure milk (the poorer in fat the better) from a cow as nearly fresh as possible, and to three-fourths of a pint add sufficient lime water to complete the pint and sweeten with a dessertspoonful of granulated sugar.

Warm this mixture to blood heat (98° F.) before feeding it and at first give the foal only small amounts at frequent intervals—say half a teacupful every hour. As the foal grows older increase the amount and reduce the number of feedings first to 12, then to 9, 6 and lastly to 4 times a day. The purpose is to keep the foal from getting hungry by making conditions as nearly natural as possible, when the young foal nurses frequently but takes only a little milk at a time.

Common disorders of the foal. It sometimes happens that the newborn foal cannot breathe. This may be due to retarded birth, to partial rupture of the navel before birth, or to membranes about the nostrils which must be immediately removed. In all cases measures must be taken quickly to establish respiration. In partial suffocation breathing may be induced by compressing and relaxing the foal's lungs by vigorously stroking the chest and by extending the front legs alternately forward and backward.

If the foal is listless and the bowels do not move within a few hours after birth, it may be necessary to stimulate their action by giving carefully a drench of 2 ounces of castor or olive oil and injecting warm water into the rectum.

On the other hand, the bowels may be so

loose as to require attention. If due to over-rapid or excessive feeding prevent this and the trouble will often cease. If due to some irritating substance in the bowels, a 2-ounce drench of oil will usually effect a cure.

If the foaling quarters are unclean the foal may be attacked with navel infection or joint disease (p. 158), so called because the joints usually become swollen and stiff. This disease is caused by filth and germs gaining access to the body by way of the umbilical vein of the navel, and can usually be prevented if the foaling quarters are kept clean.

It is estimated that approximately 25 per cent of the foals born die while less than one month old from one of the four above mentioned causes. This should emphasize the importance of proper care and management at this critical age.

Care up to weaning. The foal will usually begin to nibble at grain and hay at 10 days to 2 weeks of age at which time it should be encouraged to eat grain. A small handful of bran or oatmeal to which a little brown sugar has been added is useful in getting it into the habit. Wheat bran and oatmeal mixed half-and-half makes a very satisfactory ration for the sucking foal. Of course the foal will eat very little at first but he should have all he will consume with relish—and no more.

It seems to make little difference in the development of the foal whether it is confined to the stable or permitted to follow the mare into the field when she is at work. The inclination of the farmer and the nature of the work may decide this practice. If the foal is confined to the stable it is a good practice to permit it to nurse about the middle of the forenoon and again in the afternoon, at least until 3 weeks old. The mare if very warm should be allowed to cool off before being turned into the stable with the foal. It might be a good plan to draw a little of the milk by hand, after which mare and foal may be turned together with perfect safety to both.

Weaning the foal. Weaning is largely a matter of preparation. If the colt has been fed as suggested above and permitted to eat increasing amounts as it grew, its reliance on the dam's milk has diminished. Thus, when the time arrives for complete separation there will be little if any inconvenience for either foal or dam. If convenient, the foal should be retained in its regular quarters and the mare removed to a safe distance where it is out of sight and hearing of the colt. The colt should be fed and watered regularly; the grain ration may be the same as that suggested for the pregnant mare, as it promotes growth. At this time the udder of the mare should have careful attention to see that it does not cake. It may be necessary to draw off a little milk from time to time for a few days.

Foals are usually weaned at from 4 to 6 months of age depending on conditions. If the mare has been bred again, it is best to wean the foal comparatively early, or if either mare or foal are not doing well it may be good practice to wean the foal earlier than otherwise. However, if the mare has a full flow of milk and if her services are not needed, there is no reason for weaning under 6 months of age.

Care after weaning. If a spring colt the weanling should have snug quarters and an abundance of nutritious, easily digested feed the first winter; if a fall colt, it should receive some grain in addition to pasturage the first summer. Many colts are permanently injured by being given too scant a supply of nutritious food the first few months after weaning.

Mule Production

(SEE ALSO CHAPTER 4)

By PROFESSOR E. A. TROWBRIDGE of the Animal Husbandry Department, University of Missouri, whose sound knowledge of this important subject is the result of training and experience gained in the very heart of America's mule raising country.—EDITOR.

Mules are increasing in popularity. This is especially true in the United States, where are found some 4,639,000, or more than half of all the mules in the world. This number increased nearly 600 per cent from 1870 to 1910, whereas the number of horses in the country increased less than 300 per cent in the same time.

This enormous increase in the use of mules is due to their general adaptability and efficiency. Among the factors which have increased their popularity are the following: (1) They may be sold advantageously at weaning time. (2) Young mules may be handled in bunches like cattle, without great danger. (3) Either light or heavy mares of the proper type and quality will produce good marketable mules. (4) Mules have the good sense to take care of themselves. They seldom overeat or suffer injury through getting overheated. (5) They are usually put to work earlier in life than horses. (6) Their good sense and ability to care for themselves makes it possible for a teamster of less ability to handle them without danger of injuring them than is the case with horses.

It has been claimed that the mule stands heat better than the horse. Any difference in this respect is probably due largely to these two facts: (a) The mule does not carry as much natural flesh as a draft horse; and (b) Mules worry and fret less in harness and consequently do not become so warm.

It has been said that the mule requires less feed than the horse. Experimental data does not show that mules require any less feed per 1,000 pounds live weight than do horses, but that they do consume a somewhat larger proportion of roughness to grain than do horses. It is true, moreover, that the average mule will consume less grain during the year than some horses. Since mules are smaller than draft horses this would naturally be expected. It is one of the big reasons for their general adaptability to farm use in the South.

Mule breeding stock. The mule is a hybrid, produced by mating the mare with the jack. Its usefulness depends upon its size, quality, conformation, action, and general ability to perform hard work, therefore, these factors must be considered in the selection of satisfactory breeding stock.

Col. L. M. Monsees, of Limestone Valley Farm, Missouri, probably the largest and most successful breeder of jacks in the world says:

"A good jack for breeding purposes should be well bred. It should be black with white

markings (points), and from 15½ to 15¾ hands high. It should have a long, clean, bony head, long trim ears, a long, clean neck, well set in the withers, showing high and good style. The body should be long and deep, showing good quarters and a well-sprung rib. The legs should show good, clean bone, being large in the arm and stifle and tapering evenly down to a good, big foot. A good jack must show "pep," style, and action, and should weigh, in good condition, 1,000 to 1,200 pounds."

Ample length of body with good depth and medium width are essential; also good muscular development with strong, straight back and a good middle. The bones of the legs should be of good size and the cannon should be flat, with the tendon set well back. The legs should set squarely under the body. One of the most frequent deficiencies in jack stock is crooked hind legs.

Sluggishness in jacks is always undesirable and a sign of a lack of nerve force. Proper energy is indicated by intelligent activity of the ears, eyes, head, and neck, gracefulness of movement, and an alertness that betokens an interest in everything that goes on about the animal. Good action at the walk and trot is essential in mules, and, therefore, in the jacks that are to sire them.

The most popular color in mules is black with a mealy nose and underline. Grays, bays and chestnuts also sell well but objection is made to a light unstable color that is apt to fade.

There is much difference in opinion as to the kind of mares that produce the best. Some argue that the draft mare is most satisfactory; others contend that mares of the lighter breeds produce the best mules. It is generally conceded, however, that a good mule mare of whatever breed must have quality, good action, an alert, keen disposition and a good strong conformation. Sluggishness or coarseness can be endured more easily most anywhere else than in mule mares.

Jacks do not serve mares readily unless properly handled. This difficulty may usually be prevented or lessened by pasturing them, from weaning time until old enough for service, with fillies, and by *not* permitting them to associate with jennets.

Mares, in exceptional cases, seem to be afraid of jacks. The most satisfactory method of breeding such a mare consists of "trying" her with a stallion and then permitting the jack to make the service.

CHAPTER 3

Training and Fitting Horses

By PROFESSOR M. W. HARPER. The third stage in horse management for those who can and care to enter upon it, is the training of horses for useful service. Some men are born trainers; others never learn the art. But any farmer who has to do with horses should know something of the principles upon which their control and instruction are based.—EDITOR.

THE usefulness of the horse depends largely upon his training and his obedience to his master's will. The best methods of training him, and of establishing agreeable relations between him and his master are therefore of the greatest importance. With few exceptions training the horse for his life work is not difficult, yet much of the viciousness existing among horses is due to improper training or unwise management. The trainer and driver, though innocent of the fact, are often at fault, and the horse, having been confused in his training, consequently is unable to understand either what is expected of him or how to perform his work to advantage.

Training and Breaking

In common usage, the word "training" implies fitting a horse for special work, as racing, coaching, saddling, and the like, while "breaking" signifies fitting him for every day work and overcoming bad habits.



FIG. 19. Horse "breaking" as commonly practised on the Western ranges

This usage of words is unfortunate, for only too often the horse is "broken" in spirit and obeys (or more accurately ceases to resist) because he is cowed down or worn out, and has not the energy to refuse. The horse thus managed often surprises his driver by running away, kicking and the like when given a few days' rest. To avoid such trouble and to increase his efficiency every horse should be trained step by step until he thoroughly understands what is expected of him as well as how to use his power most effectively.

Methods of training. The many ways of attaining the desired results in training a horse may in a general way, be divided into 2 classes; the slow and the rapid. In the slow method reliance is placed on repetition in fixing ideas in the horse's mind, while in the rapid method intensity of impression is the main reliance, although in this method, too, some repetition is needed to fix the idea.

The horse occupies a unique position in economic life for he is constantly associated with man in the performance of daily work, and this constant interdependence establishes close relationships between them. Because of this the horse's intelligence is often overestimated and he is often credited with the power of reasoning. In reality the horse lacks the ability of acquiring knowledge by drawing conclusions. This being true he

can be taught only the associating of ideas. However, he has a good memory, and what he once fully understands he seldom forgets. Thus a touch of the whip on the hind quarters implies that he is to go forward, but if given the command "get up" just before being touched, he soon learns to connect the command with the stroke and to act at the spoken word.

The horse that has thus learned by heart only desirable ideas is said to have good habits; if the ideas, and hence his acts, are undesirable he is said to have bad habits. To the horse, however, the habits are neither good nor bad, but only his way of responding to any given treatment.

There are 3 factors that influence the ease with which events are remembered and hence the ease with which habits are formed. First, the power of connecting ideas (and therefore of memorizing) decreases with increasing age; consequently the training should begin at a comparatively early age. Second, fatigue, either mental or physical, impairs the memory; hence, the training should not continue at any one time so long as to tire the horse either in mind or muscle. Third, the greater the number of ideas associated with the same event the weaker each becomes; thus each idea should be developed around a different event—whether command, signal, or act.

Training the Foal

The foal should be taught a few simple lessons very early in life. At this time he has few ideas and few fixed habits and is trained with comparative ease. If the youngster is thrifty, the very first day of his life is none too soon to begin as we can show rather than force him to do that which he does not understand. First, obtain his complete confidence. To do this carefully handle the foal all over, exercising special care with the ears, the back of the front legs, the flanks and the front of the hind legs as these parts are extremely sensitive to the touch.

Catching foal the first time. To avoid confusing the foal the first time you catch him place one arm behind, about the buttocks, and the other in front under the neck and about the shoulder joints. Now should the youngster attempt to move forward, apply pressure in front with the hand about the neck; should he attempt to move backward, apply pressure behind with the hand about the quarters. To stimulate the foal to walk forward, relieve the pressure in front and apply it at the rear, and to induce him to step backward, relieve the pressure at the rear and apply it in front. The colt caught in this manner will understand what is expected of him.

In this connection it is interesting to note the factors governing the movements of the horse. For example, when the horse gets his front foot over an obstruction and feels the pressure on the back of the legs or feet, he pulls backward until he frees himself, even though he may seriously injure himself in so doing, whereas he could very easily free himself by taking a step forward. Likewise if the hind leg or foot is caught he struggles forward in the same unreasonable manner, though he could free himself by a step to the rear. It appears that the centre of action in the horse is somewhere near the centre of the body and that pressure from behind that centre induces a forward motion, and pressure from in front of it a backward motion. Thus it is much easier to back a horse when grasping its head or neck than to drag it forward. Similarly if a tin can partly full of stones is tied to a colt's tail so as to drag on the ground, he goes



FIG. 20. How to catch and hold a foal

forward just like a dog. This is an important principle in the training of horses.

Training the foal to lead. The best time to teach the foal the use of the halter is when he is about 10 days old. For this purpose a web halter is preferred to either rope or leather as it is much lighter and not so likely to injure or frighten the foal. Also a halter that has been in constant use is better than one that has

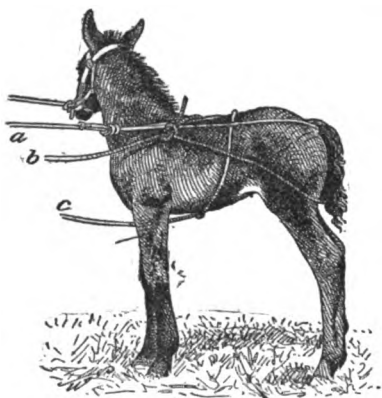


FIG. 21. Three rope hitches for leading a foal: *a* the tail hitch; *b* the quarters hitch; *c* the loin hitch

been hanging up or a new one that smells of things that are strange to the colt. With the web halter properly adjusted coax the foal along with his mother on some accustomed route, to the watering trough for instance. A taste of sugar will usually induce him to follow promptly. Do not pull on the halter for, at this stage, this only induces the foal to shake his head and step backward.

If the foal refuses to lead, take advantage of his natural instinct and apply pressure at the rear, since we wish him to step forward. There are 3 hitches used in teaching the obstinate horse to lead—the loin hitch, the quarters hitch, and the tail hitch. To make the loin hitch, procure a small rope or sash cord about 10 feet long and tie a small loop in one end. Place the rope about the foal's body with the loop on the under side so that

when the free end of the rope is run through it the rope may be drawn closely about the loins and flanks. The rope is now passed forward between the front legs and then through the ring on the halter. To make the quarters hitch, make the loop or bowline knot of such size that when placed in position on the foal it will go around the quarters and leave the knot well forward on the back. In the tail hitch the loop is made about the size of a crupper and placed under the tail like one.

With any one of these hitches in place, pull gently on the halter strap and as the foal begins to shake his head, give the hitch rope a sharp pull and he will spring forward true to his instincts. Then secure his confidence by feeding a little sugar and try again. Soon he will lead by the use of the halter strap alone when the hitch rope may be removed.

Teach only useful lessons. The young foal should be taught such things as will be useful to him in later life. Thus he should be taught to be handled, to lead, the meaning of such commands as "whoa," "get up," "back," etc., as well as that frightful objects and sounds will not hurt him. Because the foal is bright and easily taught it is not an uncommon practice to teach him tricks such as rearing, kicking, biting, and the like, all of which he is likely to remember throughout life, at the cost of some of his usefulness.

Training the Work Horse

Before the training begins, the horse should be examined to see that he is in good physical condition and that he does not possess some defect that may interfere with his learning. The teeth may possess sharp edges which may injure the tongue thus causing pain which will detract his attention from the work in hand. His sight may be poor or his hearing defective. If the animal has received little or no attention as a foal it will be necessary to get him used

to handling and then teach him to lead much as suggested under Training the Foal above. But at this time the same simple task will require much more patience.

Age to train for work. The kind of work to be performed will decide at what age the training should begin. Where the work is light and the working hours comparatively short the colt may be put to work at the age of 2 or 2½ years, particularly if well grown. If the colt is thrifty it is poor economy to keep him idle after he is 3 or 3½ years old. But a two- or three-year-old filly that has been bred and is in foal should never be put to work that is the least fatiguing.

The horse should be trained within an enclosure from which all objects likely to attract his attention, such as wagons, barrels, and the like, have been removed. Here it is much easier to get his entire attention, and should anything go wrong and the horse free himself, he will be unable to get away. It is a good plan to first turn the horse loose in the enclosure for a while in order that he may become familiar with the place in which he is to receive his early training.

Biting the horse. Because of the importance of a responsive mouth, biting is the most important phase of horse training. Most horses can be taught the uses of the bit by means of the biting harness which consists of an open bridle with side check reins, surcingle, back-strap and crupper and 2 side lines running from the bit to rings on either side of the surcingle. See that it is perfectly fitted and adjusted, especially the bridle and bit, then turn the horse into the training enclosure to become familiar with the bit. Leave him alone with neither man nor animals to attract his attention. At first the check reins and side lines should be slack, and during the first periods the bit should not be retained in the mouth more than an hour at a time, although the harness may be used two or three times a day. Gradually shorten the side lines taking care never to make them so short that they hold the horse's head in an uncomfortable position, or draw the bit so tightly as to make his mouth sore. The number of such lessons needed to train the horse to the uses of the bit depends entirely on his individuality; some horses can be driven after biting once or twice whereas others will require a good many bittings before they fully understand what is expected of them.

Driving with lines. As soon as the horse becomes familiar with the uses of the bit, replace the side lines with driving lines and drive him about the enclosure. To prevent him from turning his head, pass the lines through the rings on either side of the surcingle; however, it is sometimes a good plan to keep one line free to be used as a lead strap in case he refuses to drive or turns around and gets mixed in the lines. By keeping the lines low in turning the guiding is favored.

As soon as the horse goes ahead nicely, teach him to guide to the right and left. To train him to turn to the right, slacken the left line and pull with a swinging movement on the right one, tapping the left shoulder with the whip at the same time should he refuse to respond. Should he come around too far, hold the whip at the right shoulder. Do *not* pull him back with the left line and do

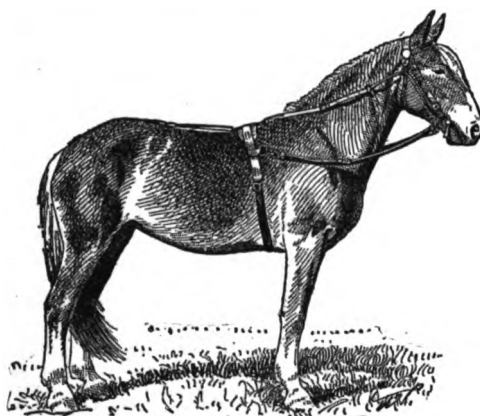


FIG. 22. Biting harness

not hit him with the whip, as either act may confuse him. In a similar manner teach him to turn to the left.

Teaching the commands. As soon as the horse becomes responsive to the lines, teach the commands "whoa," "get up" and "back." To teach the horse to stop, command "whoa" and follow by pulling on the lines, but the instant the horse stops slacken them, otherwise he may become a lugger. Give him a first taste of sugar when he obeys. It is a good plan to stop him in the same place the first few times as this aids in fixing the idea. To teach the horse to start, give the command "get up" followed by a tap with the whip. Repeat until he will start and stop at the commands alone. To teach the horse to back, stop him and when ready, draw the left line firmly and command "back," following immediately with a sharp pull on the right line. This will induce the horse to step back when he should be given a taste of sugar. Repeat until only the command is required.

Poling the horse. To prepare the horse for hitching, he should be made familiar with the pressure caused by the harness. To do this procure a light pole 6 or 8 feet long and let the horse smell and feel it with his nose. Then gently rub it over the nose, up the side of the face and to the crest. Work it back along the body and down along the outside and inside of the front legs. Continue until every part of the body and legs are familiar with the pressure. Finally lift the tail gently and place the pole under it and across the quarters as this will aid in cruppering the horse.

Hitching to cart. To avoid the possibility of an accident the first time a green colt is hitched, use a regular training cart provided with long shafts, and a seat and step so arranged that the driver can get off and on quickly. A practical cart may be made from the rear wheels and axle of a buggy by fastening 2 long hickory poles to the axle and arranging a cross bar and whiffle tree in front and a step and board seat in the rear. The shafts should be 12 feet long and provided with a strap across from point to point.

Such a cart has many advantages, especially for training fractious horses. For example, in rearing the horse strikes his front legs against the cross strap and cannot get them over the shafts; in kicking he is so far ahead that he does little

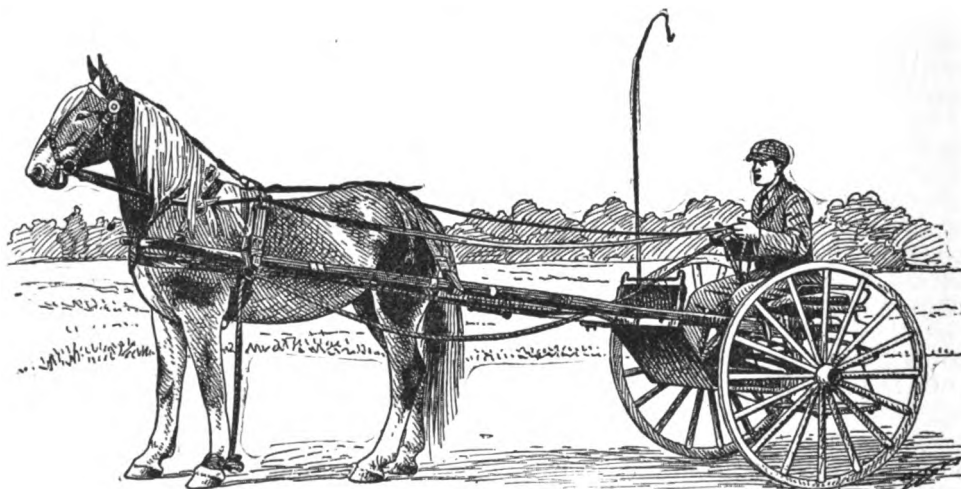


FIG. 23. A training cart and harness showing kicking strap over the horse's rump and a single safety line to be used in an emergency

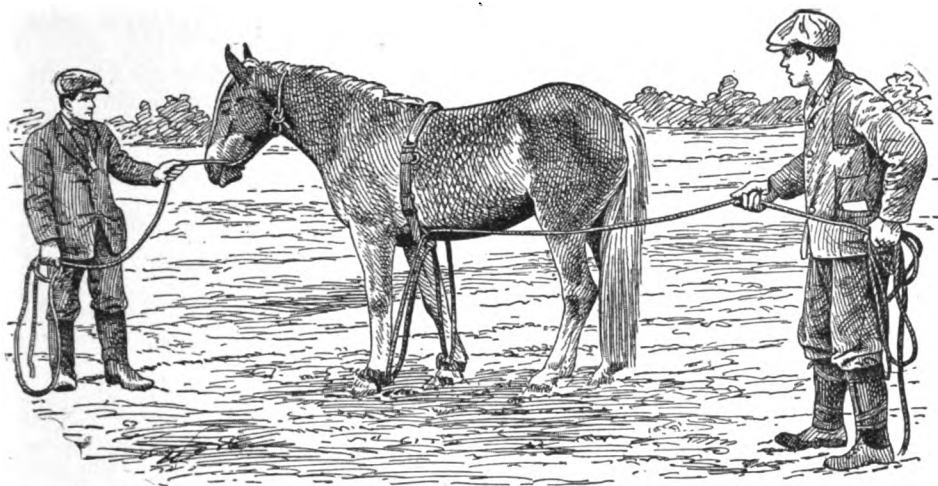


FIG. 24. Double Rarey safety in place; also a simple rope halter with which to lead fractious horses

or no damage; in attempting to turn suddenly, he is obliged to make so large a circle that no injury results; and in throwing himself, the shafts are so long and springy that little damage is done.

Before securing the horse to the cart, he should be familiarized with it. To do this allow him to feel and smell the shafts, rub them along the head and indeed all over the body and between the legs as in poling. The first time the horse is hitched a kicking strap should be used. As a precautionary measure, an assistant provided with a lead strap should remain near the horse's head to aid in starting, turning, and stopping him.

Safety appliances. To aid in training the fractious horse employ safety appliances which use his own strength in overcoming him, or inflict the necessary punishment at the instant he cuts up. The most widely used appliance is known as the Rarey safety and consists of a surcingle fitted with 2 rings at the bottom, 2 on either side and 1 at the top, 2 short straps about a foot long fitted with D-shaped rings, and a long rope. As the short straps are to be buckled about the horse's front pasterns they should be padded to prevent chafing.

To arrange this harness, put the surcingle and short straps in place, then pass one end of the rope through one of the rings on the left side of the surcingle, then down and through the D-shaped ring at the left pastern, then up and through one of the rings at the bottom of the surcingle, then down and through the D-shaped ring at the right pastern then up and tie it to one of the rings on the right side of the surcingle. Now to restrain the horse when he attempts to rear, bolt, run away or buck, it is necessary only to pull on the free end of the rope which brings him to his knees. To avoid injuring the knees they should be padded. A few hard falls are usually enough to convince even the most fractious horse that he must not run, rear, bolt, or buck.

Hitching double. Some trainers prefer to hitch double from the very first although a horse is not well trained until he will work single and double, and on either side. The first time a green horse is hitched double a well trained, gentle, but active horse should be used with him as it is important to teach him to walk fast from the very beginning. The wagon used should carry a good brake so the driver can control the load according to the disposition of the horse.

Train the horse to walk fast. There is no gait so practically useful as a

fast walk, yet it is often entirely neglected in training the horse for his life work. To train the horse to walk fast, urge him from the very beginning to walk up to his limit. Do not permit him to mope, as the habit rapidly becomes fixed. Should he break into a trot, steady him, then try again. He should not be made to walk far at first without frequent rests.

To illustrate the value of fast walking consider a team plowing with a sixteen-inch plow and assume that it cuts full capacity. To plow one acre the team must travel a little over 6 miles. If the team walks one mile per hour, in a 10-hour day it will plow 10 miles or one and two-thirds acres; if it walks a mile and a half per hour, it will plow about 2½ acres; if it walks 2 miles an hour, it plows over 3 acres; and if it walks 2½ miles per hour, it will plow almost 4 acres in the ten-hour day. Of course a team cannot do this in all kinds of soil, but the figures illustrate the value of fast walking.

Train the horse to pull. To train the green horse to pull, hitch him alongside an active, even puller. The first few loads should be light—say 300 pounds—of bulky material such as hay, and the road should be smooth and hard. After driving a short distance the load may be doubled, the object being to get the horse familiar with the pressure of the harness, especially the collar, and to endow him with the idea that he can pull anything that is loose at both ends.

Training the Roadster

The preliminary training of the roadster or the coach horse should be similar to that outlined above. The further training of the light horse calls for patient effort, unlimited tact and native ability. Indeed no set of

formation will respond quickly to proper biting and shoeing, whereas the horse with a wild disposition, vicious temperament, and poor conformation may offer so difficult a problem as to make his development hopeless.

The action often can be improved by the use of a curb bit. If the head is held up with the check rein, and the nose is held in with the curb bit, the horse, when urged forward, will step up, so to speak, instead of forward. Very little pressure need be exerted to hold the nose in. Likewise the action can be improved by proper shoeing; if the horse extends too far, reduce the weight of the shoes at the toes and gradually increase it toward the heels; if he folds and bends his knees too much, increase the weight toward the toes and reduce it toward the heels. Of course this must be done so as not to interfere with the level of the foot for if the natural position of the leg is interfered with the wear will not be equally distributed and lameness is likely to follow.

To show his action to advantage, the horse must be in fine condition, he must be strong and full of nervous energy, and he must be regularly and judiciously exercised. He must not only know how, but he must also have the power and will which come only from high condition and wisely regulated exercise.



FIG. 25. Both old and young colts gain confidence by being driven beside an older, steadier horse

rules can be laid down that will apply in every case, as horses vary widely in disposition and temperament, and the methods that will bring the desired results with one will not apply to another. The horse of good disposition, mild temperament, and correct con-

Training the Saddle Horse

There are three classes of saddlers—single gaited, three gaited, and five gaited. The single gaited horse need perform only the running walk; the three gaited horse must know the walk, trot, and canter; and the five

gaited saddler must be able to perform the walk, trot, canter, rack and, for the fifth, any one of the slow gaits—the running walk, fox trot or slow pace.

Like the training of the roadster and coach



FIG. 26. How to hold the reins in riding: a One hand, single bit; b One hand, double bit; c Two hands, double bit.

the horse to guide by pressure of the legs. For example, closing the knees with equal pressure on either side tends to steady the horse while in action; closing the lower legs, slightly to the rear, with equal pressure on either side tends to encourage the horse to keep up to the bit; placing the right leg to the rear and closing with pressure tends to stimulate the horse to move his hind quarters to the left; a similar action with the left leg causes the horse to move his hind quarters to the right. Also the horse should be taught to guide to the left by closing the knees and inclining the body to the left, and to guide to the right by closing the knees and inclining the body to the right.

The walk. Draw up on the snaffle rein so as just to feel the mouth and allow the hand to be slightly influenced by the movements of the head (Should the rein be held too firmly it will cause the horse to shorten his step.) Now apply the unspurred heel in such a manner as to induce the horse to increase the length of his stride, without going into a trot. Should he break, try again, this time steadying him gently by a slightly increased pressure on the bit.

The trot. Draw up on the snaffle rein, this time with a rather firm hand. Gently urge the horse into a slow trot and as he starts rise in the saddle, as this induces most saddle horses to trot, particularly if urged at the same time. Should he break, bring him to a walk and try again, but this time as you rise, reach forward with the right hand and grasp him by the mane well up the neck. The horse should next be taught to lead off at the trot with either front leg at the will of the rider.

horse, the training of the saddler calls for skill and experience. And horses vary widely in their ability to learn and perform the several saddle gaits. No set of rules can be laid down that will apply in every case; the trainer must know just what movement the horse must make in performing each gait and in addition he must know how to make him perform these movements.

After the preliminary training—bitting, mouthing, driving with lines and the like—perhaps the first lesson should be to teach

The canter. Take the horse at the walk, draw up on the curb rein, pull him up until his legs are well under him, then lean slightly forward and urge him forward by the gentle use of the spurs, restraining him at the same time with the curb. Many persons, as he starts, salute him military fashion with the right hand. With a well trained horse this salute serves as a signal to start him cantering when the rider leans forward and holds him together.

The rack. Draw up on the curb rein and urge the horse forward by closing the knees so that he will feel the clasp, and giving him the spurs. In other words, spur him for-



FIG. 27. An ancient statue showing what authorities call "the natural riding seat"

ward and curb him back at the same time. Should he make a break, try again, this time giving the reins a side to side shake. Sit firm in the saddle and urge the horse up against the curb. The rack is severe on the horse and should never be continued too long.

The running walk. Draw up lightly on the curb rein and urge the horse just out of a walk by a gentle touch on the spurs, and as he starts reach over and touch him on the withers. As in the walk, the horse must have the freedom of his head, as he keeps time to his steps by nodding it.

Fox trot. Draw up on the snaffle rein and urge the horse into a short trot, and hold him steady. Do not let him go into a regular trot, or fall back into a walk.

Slow pace. Draw up mildly on the curb rein and urge the horse just out of a walk by pressure of the legs and a slight side to side shuffle of the reins. When he takes the gait hold him steady.

Special Shoeing for Special Purposes



FIG. 28. A shoe to prevent interfering, showing how it is cut away on the inside and thickened on the outside branch.

In a general way defects of conformation reflect themselves in defects of action. Thus the horse with a short neck and heavy head often possesses a short, stilted action; thick withers and a wide chest often cause the horse to roll his feet outward; the horse that stands with his front feet wide apart has a tendency to straddle; the knock-kneed one, to dish; the one that toes in, winds out; and the

one that toes out, winds in.

Many such defects in action may be corrected in part at least by modifying the shape of the foot and by special shoeing. In case the horse forges or overreaches he should be shod so as to hasten the action of the front feet and retard the movements of the hind feet, in order to allow the former to get out of the way of the latter. The action of the front feet often can be hastened by slightly rounding off the toes and raising the heels; the action of the hind feet often can be retarded by raising the toes and lowering the heels.

In like manner the action of the horse that winds out often can be improved by slightly increasing the thickness of the shoe on the inside branch; that of one that winds out may

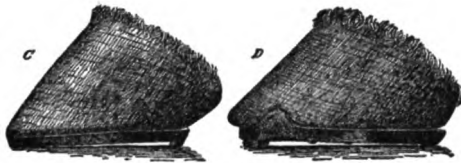


FIG. 29. Shoeing to prevent over reaching. c. The front feet with raised heels. d. The hind feet with low heels and raised toes.

be corrected by slightly increasing the thickness of the outside branch of the shoe. If the horse interferes the difficulty can be corrected in part by rasping the inside of the hoof so as to slightly reduce its convex form then placing the inner branch of the shoe under the foot as far as possible without bruising the sole. The inner branch of the shoe should be rounded so there will be as little danger as possible of injuring the opposite leg. Special shoeing for special purposes calls for a careful study of each animal and a knowledge of the anatomy and action of the legs and feet.

Fitting for the Show Ring

The fitting of the horse for exhibition should be carefully done because of the importance placed upon high condition in the show ring. This is particularly true of breeding animals of both sexes, which, in order to win, are sometimes so highly conditioned as to interfere with their breeding capacity. Indeed some are rendered temporarily sterile by such management. To avoid such difficulties so feed and exercise the animal as to keep it in thrifty, healthy condition.

The quality of the feed used is of more importance than the quantity. It should be rich in mineral matter and flesh forming material. Use such feed as oats and bran together with sweet, clean timothy hay and clover or alfalfa; an occasional carrot is useful in improving the physical condition. Sometimes glauber salts are given to keep the animal in good physical condition particularly when the feeding is heavy and there is little or no opportunity to exercise. If possible, however, the horse *should* be exercised regularly in order to stimulate his appetite, promote digestion, favor assimilation of food, improve the muscular tone as well as the nervous adaptation and thus keep the horse in high spirits so that he can control his nervous and muscular action and show himself to greatest advantage.

The grooming should receive special attention. The body should be rubbed often to improve the feel and appearance of the coat. Likewise the legs should be thoroughly rubbed to stimulate the flow of blood and promote their healthy development. The use of blankets also improves the general appearance by keeping the coat smooth and silky and tending to thin the hair.

To improve the general appearance the long hairs about the ears, head, back, body, and legs are closely clipped, except in those draft breeds in which long hair on the legs, or "feather," constitutes a breed characteristic. The hoofs are polished to improve their appearance, and rosettes are often braided into the mane and tail to show off these points to advantage. Professional breeders and exhibitors of certain draft breeds dock tails to show off the quarters to better advantage, but for the farmer's purposes, braiding, combing and trimming of the hair will suffice and will also leave the horse better equipped to protect itself against insect pests.

The horse should be trained to show himself advantageously, the requirements varying with the class. The drafter should be trained to stand at attention while in the ring; the roadster and coacher to show their action to advantage as well as to stand quietly and at attention; the saddler should be perfected in whatever gaits he is supposed to possess, and in addition be trained to stand quietly while in the ring.

CHAPTER 4

Types and Breeds of Horses—United States Horse Industry Statistics

Based on material and data obtained from PROF. C. W. BURKETT, Editor of the "American Agriculturist," standard text books including Plumb's "Types and Breeds of Farm Animals," Curtiss's "Judging Live Stock," Gay's "Productive Horse Husbandry" and Bulletin 122 of the Illinois Experiment Station on "Market Classes and Grades of Horses and Mules."—EDITOR.

SINCE the earliest times the horse has appeared in history as a domestic animal. With the spread of civilization it has been introduced into every country of the world where, as a means of transportation, a beast of burden, an essential factor in agriculture, and an important feature in the conduct of both sports and wars, it has been an invaluable aid to man. Its ability to adapt itself to varied and adverse climatic conditions; to successfully withstand the strain of hard labor; to subsist on a great variety of forage; and to accustom itself equally well to mountains and lowlands has made its place in history and human progress secure.

Classes and standards. Horses, in their present highly developed and perfected state, naturally fall into two classes—heavy horses of great weight and power, intended for draft purposes, and light, fast horses intended for riding, driving, or both. Horses of each of these classes are judged according to 2 standards. The first is the show standard which is applied mainly if not solely to registered purebreds and which is based on score cards—one for each breed—listing qualities such as conformation, style, and action, that are most apparent in the show ring. The second is the market standard or classification on the basis of usefulness and fitness for a certain type of work. This may be applied to purebreds, but since these are more often kept for breeding purposes than merely as work stock, it is much more important in its relation to grades; and these, of course, are the animals with which the average general farmer is most familiar. In addition to the tables listing the distinguishing characteristics of the breeds of horses in America, this chapter contains (a) discussions of the heavy and light classes by breeds; (b) a discussion of the various breeds of jacks; and (c) an explanation of the American market types and classifications of horses and mules.

The Heavy Type

What it is. Heavy horses have been bred and developed for draft purposes in which weight, size, and strength are essential. *Weight* is of primary importance since upon it depends to a large extent the pulling power of any given animal. The three draft sub-classes—light, medium, and heavy—cover a range in weight from 1,500 to 2,000 pounds or over. *Height* as a rule accompanies weight and the two should be in proportion. The range in heavy horses is from 16 to 17½ hands. *Strength* or *power* is almost entirely dependent upon the presence of sufficient weight and height in the right proportion. *Quality* and *substance*, as denoted by

fine silky hair, large but smooth bone, and large, roomy but neat joints, when taken together serve as an indication of quality and substance throughout the animal. *Constitution* and *endurance*, indicated by large girth, short coupling, broad muzzle, large and open nostrils and well muscled body, to a large extent determine the value of a draft animal; abundant vitality, stamina, and lasting quality indicate a long life of usefulness. The *temperament* of the draft horse should be docile, steady, willing, and consistent; either too much life or a tendency toward sluggishness is objectionable. *Style* and *action*, though given less weight than in light horses, are nevertheless important as indicators of good condition and correct conformation. Style depends upon compactness and symmetry of form, good carriage, and correct proportions. Action demands first a fast, straight, elastic walk, and considers as less important though highly desirable a free, springy, well balanced trot. Faulty conformation is indicated by rolling, paddling, forging, etc., and a slow, irregular, or stiff walk is considered highly undesirable, as are unsound legs or feet.

The Heavy Horse Breeds

Belgian. This breed, developed in Belgium; is low, compact, massive, and broad chested. Its commonest colors are roan and chestnut; though bay, gray and brown, and, rarely black occur. It compares quite favorably with other draft breeds because of its strong, broad, low set body, but the short neck and the legs and feet have been criticized to some extent. The legs frequently are light in bone as compared to the body weight, and the joints show a tendency toward grossness. The most important objection, however, has been directed toward the small feet which tend to be high and narrow at the heel and lacking in circumference. For a breed showing such width of chest the action is good, the trot being better than the walk in which rolling is not uncommon. In docile temperament the Belgian is undoubtedly unequalled.

American Association of Importers and Breeders of Belgian Draft Horses, Wabash, Ind.

Clydesdale. A breed characterized by the

silky hair or "feather" on the back of its legs below the knees and hocks, and by its white feet and face. It was developed in Scotland where special emphasis is placed on quality of bone and feet and superior action, in which characters it ranks ahead of all other draft breeds. It is unsurpassed also in its high withers and sloping shoulder and pastern. Lack of depth and girth of body and a narrow chest have been the main grounds for criticism in the past but these defects have been largely overcome of late years. In the United States its hairy legs have proved a handicap, especially in regions of soft, deep soils where the mud is often deep. While it is best to leave the feather to serve its natural purpose as a protection, this involves considerable care whenever it becomes wet or caked with mud, especially in winter. Many farmers therefore prefer smooth legged horses. Breeders and exhibitors have at times taken exception also to the liberal white markings, open textured and often white hoofs, and excessive refinement and quality, but on the whole the Clyde is a strong contender for the rôle of second most important and popular draft breed in the United States.

American Clydesdale Association, Chicago, Ill.

French draft. Not a single breed but a group of several, of which the Percheron is the best known and most important. The other breeds are important only in France, never having been extensively imported to the United States. In order of their importance they are: Boulonnais, Breton, Nivernais, Ardennais, and Picardy.

National French Draft Horse Association, Fairfield, Ia.

Percheron. For centuries this horse has been bred and developed in the La Perche region of France. Introduced into America about 1850 it soon won the approval and popularity that it has held ever since; at present

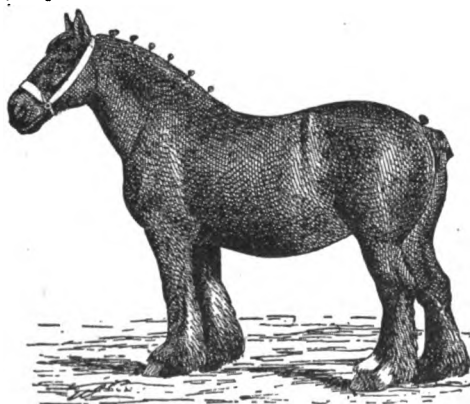


FIG. 30. Typical Shire mare



As a work animal



In sport

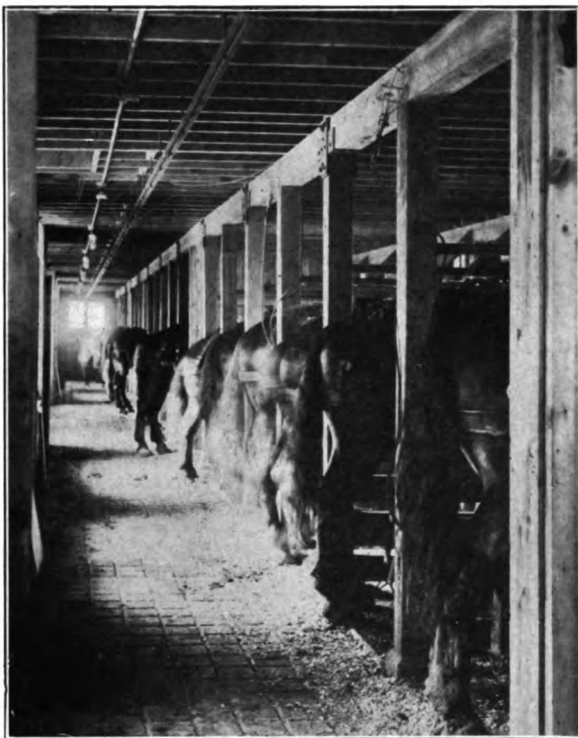


In war



As breeding stock

FOUR WAYS IN WHICH THE HORSE SERVES MAN



Plain, substantial,
roomy, clean quar-
ters for a large
number of horses

Well-kept, well-
equipped teams
ready for the
day's work



TO BE EFFICIENT, THE WORK HORSE MUST BE WELL SHELTERED, EQUIPPED, AND CARED FOR

it is undoubtedly our most popular draft breed. The stamp of the Percheron sire left on the offspring from native mares has greatly improved our work animals, especially in the draft and chunk classes. The fact that Percheron grades come first in numbers among the farm horses of this country indicates the popularity of this breed.

The distinguishing features of Percherons are even temperament, compact body, unusual refinement, clean legs and extreme flexion (high, snappy action). The chief criticisms are directed at a tendency toward light bone, straight pasterns, and a steep croup, but these features are also considered by Percheron breeders as inconsistent with the highest standard of form and quality set for the breed.

Percheron Society of America, Chicago, Ill.

Shire. An English breed, somewhat similar to the Clydesdale in that it has hair or feather on the lower legs. It is larger, however, and indeed the heaviest of the draft breeds. The feather is much longer and fuller than in the Clyde, and tends to be coarse and kinky rather than silky. The bone is large, but often coarse and round, and the hoofs are criticized for their open, loose, or spongy texture—a condition to be expected in breeds developed in low, level countries. The Shire is distributed especially through the Mississippi Valley and westward but can hardly be called a thoroughly popular breed in the United States as a whole largely on account of its heavily feathered legs, coarseness, sluggishness, and ponderous awkwardness. Where size is desired, however, Shire blood is a most valuable factor in a cross.

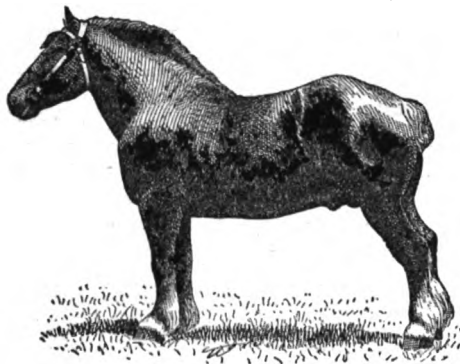


FIG. 31. A high class Suffolk stallion

American Shire Horse Association, Bushnell, Ill.

Suffolk Punch. Developed in eastern England, this breed is characterized mainly by its chestnut color, heavy, smooth, round body, short, clean-boned legs, and desirable disposition. It has been criticized for having light bone, short legs, and feet of poor shape and texture, but in the best animals of to-day these defects are absent. Though never extensively imported into the United States, the Suffolk is a practical, easily kept, and easily handled horse for farm conditions. It averages larger in this country than in its native home. Mares with some Suffolk blood being in especial demand for mule breeding.

American Suffolk Horse Association, DeKalb, Ill.

The Light Type

Light horses, unlike those of the heavy draft class, are intended for work where extreme style and action or speed and endurance, either in harness or under saddle, are of first importance. Style, action, quality and symmetry of form, therefore, rank first among their requirements just as do weight and pulling power in the draft type. In weight this class—which is usually subdivided into heavy harness, light harness, saddle horses, and ponies—shows a range of from about 300 pounds for the small Shetland pony to 1,450 for the German Coach. *Height* shows a similar extreme range, from 9 hands (36 inches) or under to 16-2. *Strength* and *power* should be represented by at least moderate speed; slow, ponderous pulling strength has no place in the make up of the light horse. *Quality* and *endurance* are even more important than in the heavy draft class, especially in the show ring. Pliable skin; short silky hair; smooth, strong, and not over-large bone; roomy but neat joints; symmetry of form, all indicate quality and refinement. Great *constitutional* vigor and *endurance* have been attained by centuries of careful breeding, crossing, and selection with the development of stamina, speed, or action, and muscular strength as the motive. All surplus weight and all signs of coarseness have as far as possible been eliminated. In *temperament* light horses are inclined to be spirited and high strung, no doubt due to the infusion of the hot blood of the Arabian horse; a tendency toward sluggishness is seldom noted except in certain of the larger coach breeds. *Style* and *action*

BREEDS OF HORSES IN AMERICA

BREEDS	ORIGIN	PURPOSE	HEIGHT (Hands)	WEIGHT (Lbs.)	COLORS	SPECIAL CHARACTERISTICS
American Saddle Horse	Kentucky	Riding	15-1 to 15-3	950-1050	Bay, brown, black	Grace, easy-riding qualities.
American Standard bred. (Pacer and trotter)	Eastern U. S.	Driving, racing (Light Harness)	15 to 16	850-1150	Bay and brown	Speed prepotency. More valued for road work than in the showing.
Arab	Arabia	Riding	14 to 14-2		Bay, white, gray, chestnut, black.	Fine quality, great endurance, fiery temperament.
Belgian	Belgium	Heavy draft	15-3 to 17	1800-2000	Chestnut	Great size and strength; docile nature; broad chest, large neck; short coupling.
Cleveland Bay	England	Riding and driving	16-1 to 16-3	1200-1500	Bay	Color. Uncommon in U. S.
Clydesdale	Scotland	Heavy draft	16-3 to 17	1800-2000	Bay or brown white points.	Silky hair on lower legs; quality of bone, feet, and pasterns; good action, fast walk.
French Coach	France	Driving (Heavy Harness)	15-16	1300-1425	Bay to brown.	Level croup. Style, action.
German Coach } Hanoverian } Oldenburg }	Germany	Driving (Heavy Harness)	16-16½	1350-1450	Bay, brown or black.	Spirit, vigor, action. Slightly heavier than the French coach.
Hackney } Hackney Cob } Hackney Pony }	England	Driving Driving and riding	15-2 to 15-3 14-1 to 15-1 14-1 or under	1100-1300 900-1100 under 900	Chestnut, brown or black.	High knee and hock action; soundness; high strung and spirited nature.
Morgan	United States (Vermont)	Driving light harness and riding	14 to 14-2	900-1150	Bay, brown or black.	Endurance, determination, quality and prepotency. Representatives though few are highly thought of.
Mustang (Indian pony, Broncho)	Western U. S.	Riding	12 to 14	600-850	Brown, black, etc. (Piebald)	Endurance; vicious disposition; speed and strength.
Orloff Trotter	Russia	Driving	15-3 to 16-2	1100-1300	Gray, white, or black.	Grace and beauty; rounded croup; speed; endurance.
Percheron	France (La Perche)	Heavy draft	15-2 to 17	1500-2000	Gray, dark gray black.	Clean legs; large size; strength. Most popular draft breed in the U. S.
Polo Pony		Riding	14-2 and under	800-950	Dark preferred No standard	Stamina, speed, spirit, quickness, intelligence.
Shetland Pony	Great Britain (Shetland Is.)	Saddle or harness	36 to 40 (inches)	Around 350	Black, brown and chestnut.	Very small size, docility, hardness.
Shire	England	Heavy draft	16-1 to 17	1800-2000 (and up)	Bay and brown white feet. Star or blaze.	Great size; long, coarse feather on legs below knees and hocks.
Suffolk Punch	England	Heavy draft	16 to 16-2	1800-1900	Chestnut.	Short legs; large girth; uniform color.
Thoroughbred	England	Riding (Pacing)	15 to 15-2	900-1050	Bay to brown.	Speed; fine quality; small head, thin neck, long loin.
Welsh Pony	Great Britain (Wales)	Riding and driving	12 to 15		Brown, gray, white, black, etc.	Strength, vigor. Lighter build and more spirited than Shetland.

are much more important than in the heavy draft class, more weight being given to the trot and relatively less to the walk. The latter should be straight and fast; the stride long, smooth, and free, and, especially in the coach horses, proud, springy, and stylish. The trot should in every case be regular, straight, and well balanced. In addition the coachers must show extreme flexion (high, snappy action) of knees and hocks; trotters and pacers must have a long, reaching stride capable of great speed; and saddle horses are required to show style and proud carriage in addition to performing 1, 3 or 5 saddle gaits. Faulty conformation or blemishes, especially of the legs, which either impair the action or detract from the appearance of an animal, are considered disqualifying features.

The Light Horse Breeds

American Saddle Horse. This type of horse, developed in Kentucky, Virginia, and Missouri by combining Thoroughbred, Morgan, Standardbred and perhaps Arab blood with style and easy gait as the goals, is a distinct American creation. Distinguishing characteristics are high, arched neck and tail; broad, strong back; long, sloping pasterns and shoulders; finished performance at the various saddle gaits (p. 28); and in some individuals of the "hunter type," a wonderful jumping ability both in competition and in 'cross country riding. In style, carriage, and general beauty, it is undoubtedly supreme among breeds of America, perhaps of the world.

There are strictly two classes of saddle horses, the three gaited and the five gaited, though like the pacer and trotter they overlap. The first of these must be able to walk, trot, and canter; the second must perform also the singlefoot or rack, and the running walk or fox trot; in both classes easy control, sure-footedness, and good manners are essential. In a general way the five-gaited horse represents especially the park or show type seen in large cities, and the so-called "high school" performer. The three-gaited group also includes show horses, but in addition more general utility mounts used by farmers, stockmen, and officers, and in stockyard work.

The American Saddle Horse Breeders' Association, Lawrenceburg, Ky.

American Standardbred (Pacer and Trotter). This breed of racing horses and roadsters was developed in eastern United States from Thoroughbred blood, the New York State stallion Hambletonian 10, who lived from 1849 to 1876, being called its real founder. It includes two types—pacing and trotting—of similar origin, and distinguished mainly by the difference in gait. Developed first of all for friendly competition on the road and subsequently for the racetrack, it has been considered entirely with relation to speed and the characteristics that produce it. Such points as uniform color, size, weight, and general form have been disregarded with the result that great variety exists among individuals. However, the breed shows exceptional refinement, clearness of limb, and quality.

The development of speed in this horse has been a wonderful example of what animal machinery can accomplish. Of course early records were made with comparatively heavy sulkies, clumsy harness, high, hard tired wheels and on only moderately good surfaces, while modern performances have been aided by the invention of ball bearing, pneumatic tired sulkies, feather weight harnesses, boots, hoppers and other appliances, and the improved construction of race tracks. Nevertheless the advance shown by the accompanying table indicates no less strongly the result of breeding, training, and natural ability.



FIG. 32. Virginia hunter type of American saddle horse.

From the standpoint of real usefulness, the greatest importance of the breed has been its beneficial effect on the roadster stock of the country.

Pacer. The gait that distinguishes this type is a sort of sidewise racking or rolling movement produced by the alternate advance of the front and hind leg on the *same side at the same time*, as though knee and hock were joined by a "connecting rod" as in a loco-



FIG. 33. A pacer getting into his stride

motive. On the track this gait has proved slightly faster than the trot, although the best trotters can make better time than all but a few of the finest pacers. In conformation the pacer usually shows a steepness of the croup and curving of the hocks which is now associated with the gait. Among the most famous pacers are George Wilkes 2.22, John R. Gentry 2.00½, Jay-Eye-See 2.05½, Dan Patch 1.55½, and Star Pointer 1.59½.

Trotter. Shows a long, powerful, direct trot, and the absence of the sloping croup and curved hock of the pacer. Nevertheless many individuals both trot and pace and some have a pacing as well as a trotting record. Speed, strength, endurance and an all-around usefulness are its chief claims. Famous family names are Hambletonian, Morgan, and Clay; noted individuals are: Lou Dillon 1.58½, The Harvester 4.15½ (2 miles), Uhlan 1.58.

American Trotting Register Association, Chicago, Ill.

Arab. An ancient breed native to the desert country of Arabia and developed by close but careful breeding and rigid selection. As generally used the term Arabian includes also the Barb from northern Africa and the Turkish horse from Asia, breeds at one time distinct but now more or less mixed. As far as numbers are concerned it is unimportant in the United States, but the percentage of Arabian blood in our best light—and even in some of our draft—breeds is responsible for much of their quality, vitality, style, symmetry and vigor; the importance of the breed as a foundation can never be forgotten. Wherever used it has left its stamp on succeeding generations its “hot” blood always resulting in decided improvement. The English Thoroughbred, Hackney, Morgan, American Saddle Horse, and Russian Orloff all trace back more or less directly to the combination of Arab and native blood.

In size it is small, almost in the pony class; in quality and conformation, endurance, style, fearlessness and intelligence it is “all horse.” Bay, white, gray, chestnut, and occasionally black occur, usually as solid colors, white or gray being most common. The body is short,

deep ribbed and broad chested indicating great constitutional vigor; the legs are strongly muscled, rounded and carried well under the body; the neck is tapering and finely arched; the head distinctly small but well formed; the ears likewise; and the tail is full, flowing and carried high, proudly. It has been somewhat criticized for its small gaskins and hocks, high crop, thick shoulder, and broad withers, but these minor defects even when present are more than balanced by its many points of excellence.

The Arabian Horse Club of America, Washington, D. C.

Cleveland Bay. An old breed, of uncertain origin but developed in northeastern England. The color is either a light or dark bay with black legs, mane and tail; the body is large, powerful, and well formed; action is strong, but far from showy or stylish. Though exhibiting considerable merit along coach horse lines, its popularity both here and in England seems to be on the decline. Importations have practically ceased and Cleveland Bay classes been discontinued at many horse shows.

Cleveland Bay Society of America, Aurora, Ill.

French Coach. The American name for a coach horse at one time extensively imported into this country from France. It is among the largest of the light horse breeds; is usually bay or brown in color; and has the characteristic exaggerated knee and hock action of the coach type, though to a less extreme degree than the Hackney. In general appearance it



FIG. 34. The Arab horse as the artist sees him

resembles a blend of native stock with the Thoroughbred, Hackney, and Arab, from which breeds, to a large extent, it was derived. Showy style, endurance and quality made it very popular in northeastern United States until the automobile, in its development as a pleasure vehicle, largely took its place. Distinguishing characteristics are the level, broad croup, strong bone, and excellent feet.

French Coach Horse Society of America, Oak Park, Ill.

German Coach. The American name of certain German breeds, including the Hanoverian, Oldenburg, and others of less importance. These include some of the largest of modern coach horses, though in this country considerable variation in size is noted. Action also varies widely but usually does not compare favorably with that of the Hackney. Coarseness of bone, rough large joints, and large heads are not uncommon.

German, Hanoverian, and Oldenburg Coach Horse Association of America, Lafayette, Ind.

Hackney. The origin of this popular coach breed dates far back in English history. In its development horses introduced by the Romans and the Danes, Arab horses, Thoroughbreds, and native stock have all played a part. The modern Hackney is characterized chiefly by its conformation and gait. The body is close knit, the chest broad and deep, the back short, the loin broad and the croup level. The legs are short with bone of good quality. The well formed head and neck are carried



FIG. 35. Typical Hackney quality

in true coach style. The Hackney is distinctly superior to any other coach breed in action; in the extreme coach type the knees are raised high, flexed or bent, then shot out almost straight ahead, while the hocks are drawn up and carried far forward, close under the body. Soundness is another strong point of the breed, and, with Hackney quality and substance, is almost invariably found in the offspring of Hackney stallions on grade mares. The shoulders are especially desirable. Perhaps the most common criticism is that speed is lost at the expense of extreme style and high action, and that horses of this breed "run too long in one place," but authorities and individual tastes differ on this point. The Hackney has been extensively imported and until the advent of the automobile was "the horse of the boulevards and parks." Strong claims are made for it as a producer of cavalry mounts when combined with horses showing strictly saddle qualities.



FIG. 36. A Hackney pony in show condition

Hackney cob. Into this class fall Hackneys between 14-1 and 15-1 hands in height; and 900 and 1,100 pounds in weight. In other respects they are similar to the Hackney horse.

Hackney pony. A Hackney 14-1 hands or under, with all the other characteristics of the Hackney horse.

American Hackney Horse Society, Hempstead, N. Y.

Morgan. A family (or, according to its supporters who have established a stud book, a breed) of small, compact, bay, brown or chestnut horses descended probably from Arab stock but directly from the stallion Justin Morgan, foaled in 1793 at West Springfield, Mass. Developed among the hills of Vermont to perform a variety of severe tasks on both road and farm, it is possessed of tremendous energy, spirit, endurance, and power; these qualities, together with a short, round body, strong sound legs, curving neck, high crest, small head, and intelligent, invincible expression, it impresses on its offspring with remarkable fidelity. At one time the Morgan was fairly numerous in the Middle West as well as New England, and deservedly popular as a saddle horse, roadster, light drafter, and as breeding stock. Gradually,



FIG. 37. A Broucho or Western cow pony

however, most of the best animals were sold out of their native state, and in other sections Thoroughbred and other blood was interbred until now only a few true Morgans remain. A strong effort is being made to keep these pure and to increase the stock but it is probable that climate and other natural conditions as well as the simple, hardy farm life with which the breed was originally associated had a great deal to do with its development. The U. S. Department of Agriculture is also working to produce a new breed or type of American harness horse with the Morgan as a basis. Whatever results, the importance of the breed is assured because of the part it has played in the development of the Standardbred and other American types of to-day.

American Morgan Registry Association, Middlebury, Vt.

Mustang (*Indian Pony, Broncho*). A breed of ponies ranging from 12 to 14 hands in height and 600 to 850 pounds in weight, descended from stock introduced into the Southwest by Spaniards and possibly representing a mixture of races. In color and markings there is wide range; and the same may be said of disposition, for no other breed shows such uncertainty of temper, perversity, and "sheer cussedness." In form the Mustang tends to be undersized, flat-sided, and often ewe necked, but great endurance, vitality, and ability to look after itself are even more prominent qualities. It possesses a swinging, ground-covering canter or lope that is especially adapted to long journeys and the cowboy type of saddle and long stirrups, straight legged seat.

Oldenburg Coach (see German Coach).

Orloff Trotter. A Russian breed almost unknown in the United States. Resembles the Arab from which it was derived but is larger in size. Great endurance is its outstanding



FIG. 39. A Shetland pony stallion

feature, though it must also be credited with grace, beauty, symmetry, and speed.

Pacer (see American Standardbred).

Polo pony. Not a breed, but a type developed for and particularly suited to the game of polo. Its size is usually 14-2 hands or under, though individual riders often prefer more height and greater weight. Dark colors are preferred and ponies must have abundant speed, endurance, aggressiveness, and intelligence. Small Thoroughbreds, western ponies and various crosses giving the desired qualities are represented among the best mounts now in use.

Shetland pony. A native of the Shetland Islands north of Scotland. It is the smallest of all ponies, fully grown individuals of 36 and 38 inches high being common, and one 20 inches having been recorded. In type it resembles a dwarf draft horse, especially in the thick, heavy neck and head and the comparatively large, compact body.

Its mane and tail are long and very thick, and in cold climates its winter coat becomes long and shaggy just as in its native home where for the most part it lives a natural outdoor life. In soundness of feet, quality of bone, strength and endurance the Shetland ranks high; its quiet, docile disposition makes it an especially fine pet for children; and as regular breeders and good mothers, Shetland mares are often decidedly profitable. From a show ring standpoint the Shetland has been criticized for its straight shoulder, short, sloping croup and lack of action, but these faults are lacking in the best individuals and the average owner does not consider them serious.

American Shetland Pony Club, La Fayette, Ind.

Thoroughbred. This breed—the "race horse of England, Europe, and America"—was originated in England by combining the best qualities of the Arab, Barb, Turkish, and lighter English breeds. It is now found wherever a light, fast horse is desired. The Godolphin Barb, the Byerly Turk, and the Darley Arabian represent its most notable foundation stock. It is of special importance



FIG. 38. Polo pony

because of its great influence upon such modern American breeds as the Standardbred, American Saddle Horse, etc. Bred to run races, the Thoroughbred is characterized by grace, extreme refinement and certain mechanical features that are directly associated with the production of great speed. Length of body, neck, and legs; leanness; freedom and ease of motion; nervous energy; endurance; well muscled, sloping shoulders; and powerful hind quarters, indicating great strength and propelling power, are the outstanding features of the best examples of this breed. By crossing the Thoroughbred on larger, stronger mares—especially Cleveland Bay—the powerful crossbred English hunter is obtained.

The Jockey Club, New York, N. Y.

Welsh pony. A product of Wales in the British Isles, this is not always considered a distinct breed because of variations in size and type. The approved size is 12 to 14 hands but where the stamp of Arab or Thoroughbred blood is strong it may exceed 15 hands. This pony stands midway between the Shetland and the Hackney as to size, refinement, spirit and action. The average child after "gradu-



FIG. 40. Welsh pony stallion

ating" from the ownership of a Shetland would be in line for a Welsh pony before taking up a real horse. In Wales it is commonly used as a general purpose animal; the endurance, speed, and action of some of the larger individuals fit them for polo or light driving.

Welsh Pony and Cob Society of America, Mantua, O.

Breeds of Jacks

The *Jack* or jackass is a distinct member of the horse family raised, at least in America, solely to be bred to mares for mule production. In foreign countries jacks are used as draft and pack animals; here only the burro of the Southwest is used to any extent for such work, but the mule, which combines the good points of both its parents, is used for draft purposes. The female jack is called a jennet and is even less widely used, except for jack breeding, since the product of the stallion-jennet cross—the hinny—is not generally favored, and also because the stallion appears to dislike the jennet and often will not mate with her.

There are 6 breeds of jacks, all of which resemble the horse in general structure but lack its quality, finish, and pleasing symmetry. In addition to the characteristic long ears and scanty mane and tail the jack, to the horseman's eye, shows a head that is often too large; neck too short, small and poorly muscled; and a body narrow, light, and lacking in girth. However, these defects are not transmitted to the offspring when the jack is crossed on a mare for mule breeding; the shape and size of the feet and their remarkable freedom from unsoundness are transmitted, however, together with the strength, vigor, easy keeping qualities and quiet, docile temperament of the sire.

The Breeds

The American or Mammoth Jack. This is a distinct breed developed in the United States to meet our own needs and conditions, the Catalonian (p. 42) playing the most important part in its evolution. Careful combination and selection has resulted in a breed far superior to any of the parent stock in size, quality, and conformation; the mules produced by it are likewise superior to those resulting from the use of imported breeds.

In *weight* the accepted range is from 1,050 to 1,150 pounds, and the standard height calls

for 15 to 16 hands at maturity. *Quality and substance* are indicated by sleek appearance; long, well carried ears; smooth, silky, and medium length hair; large but neat joints; and large, strong, but not coarse canon bones measuring from 8 to 9½ inches in circumference. In *temperament* the ideal jack is active and alive but docile. Vicious jacks are dangerous and highly undesirable. Solid dark *colors*, especially black with white points are preferred; gray is unpopular. *Action*, while not so important as in the horse, is nevertheless to be considered. The walk should be fast, straight, elastic, and true; the



FIG. 41. A Poitou jack

trot straight, true, and free. The bottoms of the feet should be shown at the trot.

Andalusian. A native to southern Spain. Though the first introduced into this country it has been prevented by its gray color from becoming popular or numerous. This breed ranges from 14-2 to 15-2 hands high; possesses excellent, medium sized bone, a good head and neck, well carried ears, and considerable quality throughout.

Burro. The small ass or donkey of the mountainous Southwest is generally called burro. It has probably descended from stock introduced by early Spanish explorers. Its small size, like its excellent burden-carrying ability and surefootedness, is doubtless the result of its surroundings and handling.

Catalonian. This jack from northeastern Spain is of good size and usually black or dark brown with white points. Because of its medium sized bone of good quality, its early maturity, and its unusual style, substance, and action, it is the most popular of all the imported breeds. In addition to its value as a sire of mules it has played a very important part in the development of the American jack.

Italian. The smallest of all, this breed seldom exceeds 14 hands, and mainly for that reason has never become popular in America. The usual color is black but gray is not un-

common. In finish and quality of bone this breed ranks among the leaders.

Majorca. This breed from the Island of Majorca in the Mediterranean Sea, has never established itself in this country. In size it ranks next to the Poitou, but its poor quality, finish, and action, extreme sluggishness, coarse bone, poorly carried ears, and lack of compactness and symmetry, explain its lack of popularity.

Maltese. A native of the Island of Malta, either black or brown, averaging about 14 hands. Its small size and lack of bone and substance have been its most objectionable features. For vigor, quality, and style it cannot be severely criticized.

Poitou. A French jack possessing considerable merit, but little known in this country. It is the largest of all the breeds, and its large smooth joints, excellent bone and superior feet are other outstanding features in its favor. The color is usually black (sometimes gray) with white points. The hair is long and silky when carefully groomed but in France, where clipping is not practised, or elsewhere if neglected it presents a shaggy and unattractive appearance.

American Breeders' Association of Jacks and Jennets, Columbia, Tenn.



FIG. 42. A Catalonian jack

Mules

The mule is the offspring of a mare bred to a jack. Since the parents represent two distinct species the product is a hybrid. Like all hybrids it is sterile (cannot reproduce) as is also the *hinny*, an inferior mule-like animal resulting from the reciprocal (opposite) cross (of a stallion on a jennet). For this reason these animals cannot be said to represent true breeds. From its sire the mule inherits its braying voice, long ears, tufted tail, and small narrow feet; from its dam it gets most of its conformation, symmetry, size, weight, and action. Because of their smaller feet mules are inferior to horses for heavy teaming on hard pavements, but their greater resistance to heat, their ability to withstand very hard and con-

tinuous work, their comparative soundness of legs and feet and consequent freedom from lameness, their docile nature and the ease and economy with which they can be kept, particularly adapt them to draft work on farms in the South and in mines. A further noteworthy advantage is the fact that a mule, unlike a horse, will rarely if ever drink while hot, overeat, or otherwise injure itself through lack of judgment.

Since mules have no breeding value they are judged solely by market standards in which usefulness is the first consideration; in general the desirable qualities of a perfect mule are similar to those of a perfect horse.

Market Classes of Horses and Mules

Horses. In the Chicago horse market, which is to-day the largest in the world, the worth of a horse depends upon soundness, conformation, quality, condition, age, color, education, and general appearance. Utility is the leading factor; breed is much less important than individual excellence.

MARKET CLASSES OF HORSES

CLASSES AND REQUIREMENTS	SUB-CLASSES	HEIGHT (Hands)	WEIGHT (Pounds)
DRAFT HORSES Size, strength, weight, massiveness, ruggedness.	Light Draft Heavy Draft Loggers	15-3 to 16-2 16 to 17-2 16-1 to 17-2	1600-1750 1750-2200 1700-2200
CHUNKS Short legs, broad, and heavy bodies.	Eastern and Export Chunks Farm Chunks Southern Chunks	15 to 16 15 to 15-3 15 to 15-3	1300-1550 1200-1400 800-1250
WAGON HORSES Good action, clean limbs, good feet, quality, broad, deep chests, strength and stamina.	Expressers Delivery Wagon Artillery Horses Fire Horses	15-3 to 16-2 15 to 16 15-1 to 16 15 to 17-2	1350-1500 1100-1400 1050-1200 1200-1700
CARRIAGE HORSES High action, fair speed, quality, and symmetry.	Coach Cobs Park Horses Cab	15-1 to 16-1 14-1 to 15-1 15 to 15-3 15-2 to 16-1	1100-1250 900-1150 1000-1150 1050-1200
ROAD HORSES Style, speed, action, soundness, good bone and feet.	Runabout Roadster	14-3 to 15-2 15 to 16	900-1050 900-1150
SADDLE HORSES Easy, smooth gait; easy control; surefootedness; sloping shoulders, thin withers, good pasterns; abundant energy.	Five Gaited Saddler Three Gaited { Light } Saddler { Heavy } Hunters { Light } .. { Middle } { Heavy } Cavalry Horses Polo Ponies	15 to 16 14-3 to 16 15-2 to 16-1 { 15 to 15-3 14 to 14-2	900-1200 900-1200 1000-1250 950-1100 850-1000

From the practical viewpoint of the average farmer only the first three classes are important, the Farm Chunk and Light Draft sub-classes undoubtedly ranking first. The remaining classes might be considered as "fancy," since they are intended to meet the exacting requirements of a narrow and restricted market, to which the average farmer does not attempt to cater.

Sub-classes are further divided into *grades* which denote the merit of individual animals, and to a large extent determine their market (money) value. These grades are as follows:

GRADES	CHARACTERISTICS	GRADES	CHARACTERISTICS
Choice	Ideal type, quality and finish, good style, action and condition		symmetry, style or action, or slight unsoundness
Good	Must have essential qualities of its class, but not the high quality, condition, and finish of class above	Common	Lacks most of the desirable and essential qualities
Medium	Plain makeup, tendency toward coarseness, slight lack of	Inferior	Lowest possible grade

Note: Fire and park horses show only the first two grades; express horses, artillery horses and cobs the first three; and Eastern export chunks and coach horses the first four.

Miscellaneous is a general classification of such horses as do not meet the standard of the regular classes. Under this head come *feeders*—under weight but good animals; *range horses*; *ponies*—horses under 14 hands; and *plugs* or decrepit, worn out horses of little value.

Mules are held to practically the same market requirements as horses, their market value depending upon soundness, age, condition, quality, conformation, color, and action. The East St. Louis Mule Market, which is the largest in the world, has established 5 classes or groups of mules of the same general type; the grades are divisions of the class referring to quality, conformation, condition, action, and general desirability. There are no sub-classes of mules.

MULE CLASSES

MINING— Heavy bone, large feet, compactness, rugged constitutions	12 to 16 Hands	600-1350 Pounds
COTTON— Lighter bone, and body; quality; finish	13-2 to 15-2 Hands	750-1100 Pounds
SUGAR— Height, size, heavy bone	16 to 17 Hands	1150-1300 Pounds
FARM— Soundness, promise of future development. May lack weight and uniformity .	15-2 to 16 Hands	900-1250 Pounds
DRAFT— Large size, heavy bone, quality and ruggedness	16 to 17-2 Hands	1200-1600 Pounds

United States Horse Industry Statistics

By DEAN C. F. CURTISS, of the College of Agriculture of the Iowa State University, a familiar figure wherever horses are raised or shown.—EDITOR.

The present. The farms of the United States taken together contain the greatest power plant in America. According to the 1910 Census, all manufacturing enterprises in the country used 18,755,286 horsepower; according to recent estimates the farms require 23,905,000 horsepower, of which 14,230,000 horsepower is supplied by horses and mules. This, be it clear, is in mechanical terms; the actual number of horses in the United States on January 1, 1917, was 21,126,000, that of

mules 4,639,000; and their combined valuation was \$2,723,463,000.

The following table compiled by the U. S. Department of Agriculture

illustrates the magnitude and stability of the country's horse and mule industry for the past 8 years:

DATE JAN. 1,	TOTAL NUMBER	PER CENT. OF PRECEDING YEAR	VALUE PER HEAD	AGGREGATE VALUE
HORSES 1919	21,534,000	99.9	\$ 98.48	\$2,120,709,000
1918	21,555,000	101.6	104.24	2,246,970,000
1917	21,210,000	100.2	102.89	2,182,307,000
1916	21,159,000	101.1	101.60	2,149,786,000
1915	21,195,000	101.9	103.33	2,190,102,000
1914	20,962,000	100.3	109.32	2,291,633,000
1913	20,567,000	101.1	110.77	2,278,222,000
1912	20,509,000	99.8	105.94	2,172,694,000
MULES 1919	4,925,000	101.1	135.59	667,767,000
1918	4,873,000	103.2	128.81	627,679,000
1917	4,723,000	102.8	118.15	558,006,000
1916	4,593,000	102.5	113.83	522,834,000
1915	4,479,000	100.7	112.36	503,271,000
1914	4,449,000	101.4	123.85	551,017,000
1913	4,386,000	100.6	124.31	545,245,000
1912	4,362,000	100.9	120.51	525,657,000

The 10 leading horse and mule raising states, in the order of their rank, and the number and value of the two types of animals there, on January 1, 1919, were:

STATE	TOTAL NUMBER HORSES	TOTAL VALUE	STATE	TOTAL NUMBER MULES	TOTAL VALUE
Iowa	1,567,000	\$148,865,000	Texas	792,000	\$91,080,000
Illinois	1,467,000	146,700,000	Missouri	374,000	43,384,000
Texas	1,164,000	90,792,000	Georgia	344,000	68,800,000
Kansas	1,153,000	108,382,000	Mississippi	316,000	43,924,000
Nebraska	1,049,000	91,263,000	Arkansas	315,000	38,745,000
Missouri	1,040,000	95,630,000	Alabama	304,000	47,723,000
Minnesota	950,000	93,100,000	Oklahoma	288,000	31,680,000
Ohio	891,000	95,337,000	Tennessee	278,000	38,920,000
North Dakota ..	850,000	79,050,000	Kansas	260,000	29,640,000
Indiana	829,000	85,387,000	Kentucky	231,000	29,337,000

The total value of horses and mules in the United States on that date was, therefore, nearly 3 billion dollars. The distribution of these animals is shown by the maps on page 46.

The maps on page 47 show the distribution of horses and mules (and asses) over the world. The approximate figures for the leading countries are:

COUNTRY	NUMBER HORSES	PER CENT OF TOTAL	COUNTRY	NUMBER MULES AND ASSES	PER CENT OF TOTAL
Russia	35,000,000	33	United States ..	4,800,000	24
United States ..	24,000,000	23	Turkey in Asia ..	2,500,000	12
Argentina	9,000,000	9	Spain	1,750,000	9
Germany	4,523,000	4	Turkey in Europe	1,750,000	9
Austria	4,374,000	4	India	1,500,000	8
France	3,100,000	3	Italy	1,250,000	6
Canada	2,658,000	3			
World	105,400,000	100	World	20,000,000	100

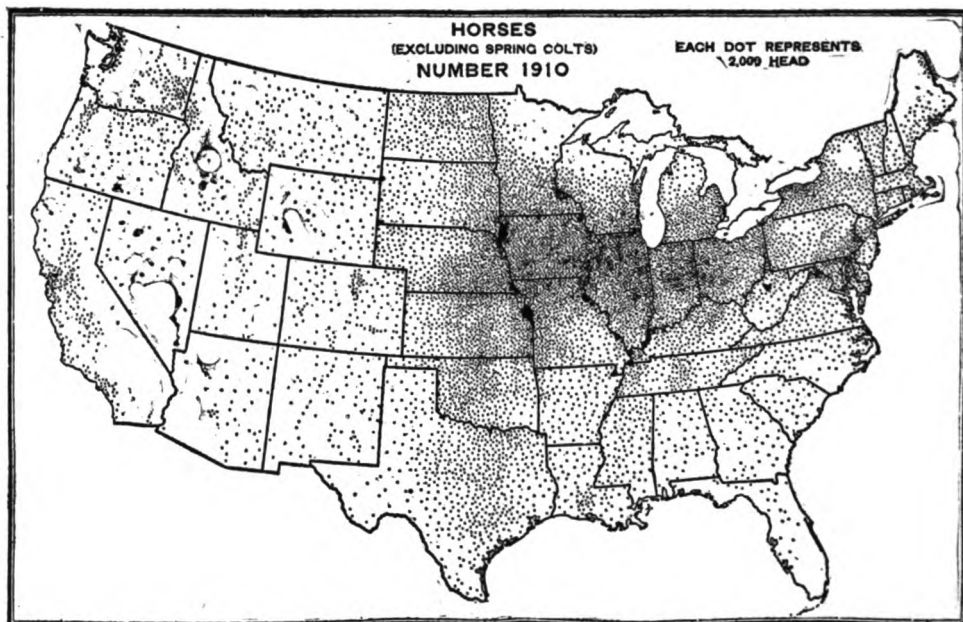


FIG. 43. Horse production, like cattle raising, has moved eastward from the range country into the farm country of the Middle West. But practically all over the country conditions are such that the average farmer can and should keep a few mares and raise a few colts each year. (1915 Yearbook, U. S. Department of Agriculture).

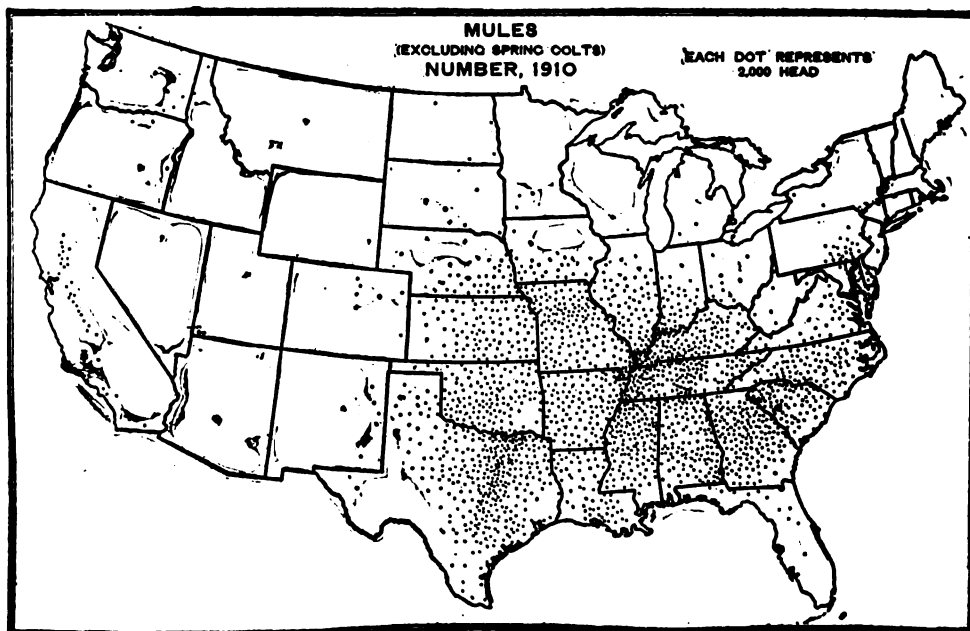


FIG. 44. The use of draft horses in the South seems to be increasing but with little if any effect on the popularity of the mule. Well cared for and intelligently handled the mule has no superior as an all round farm worker. (1925 Yearbook, U. S. Department of Agriculture).

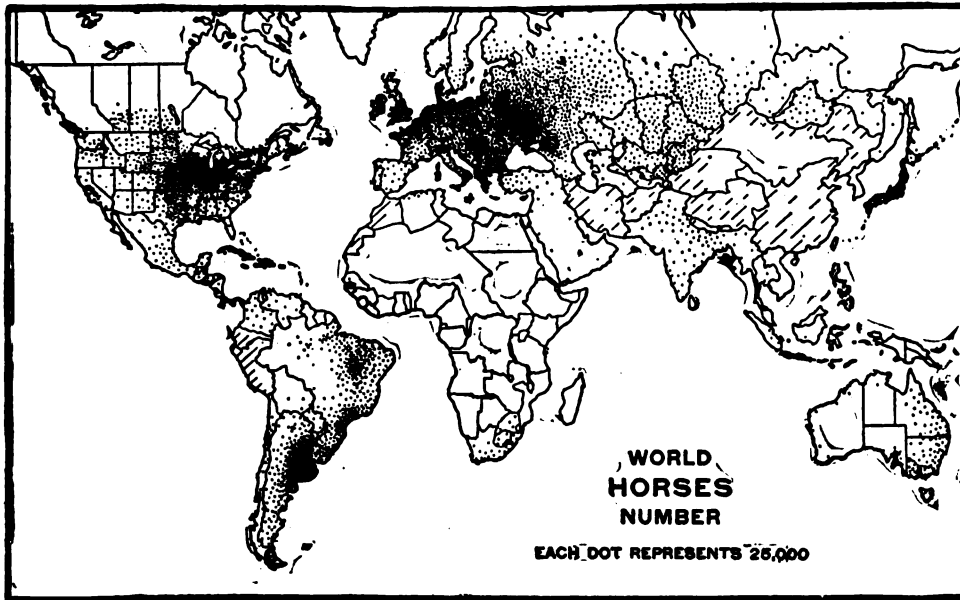


FIG. 45. The largest numbers of horses are found in Russia, United States and Argentina, typical farming and grazing nations. But there are many more per acre in the smaller countries of northwestern Europe where intensive farming is practised. In the far East, cattle largely replace horses (1916 Yearbook, U. S. Department of Agriculture).

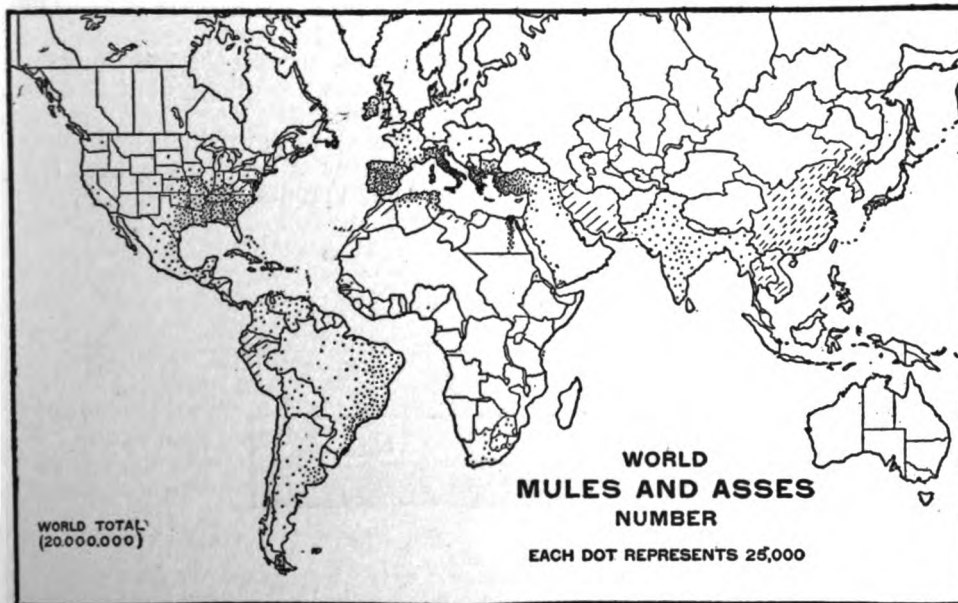


FIG. 46. Mules and asses, being smaller than horses, surer footed, and more able to live on scanty forage, are found mainly in dry, rough, countries where the people are poor and the farming is not highly developed. Southern United States is an exception, and here the mules are larger, better kept, and more powerful (1916 Yearbook, U. S. Department of Agriculture).

The horse and mule stock in the tropical countries is small and inferior compared with the heavy draft stock of cooler countries. The horse stock of the United States is worth more than that of any other two countries combined.

The future. During the war it is estimated that France lost more than 37 per cent., Italy about 25 per cent., and the United Kingdom nearly 5 per cent. of their respective stocks of horses and mules. These reductions have undoubtedly seriously curtailed the normal rate of increase throughout Europe as well as depleted the supplies of work stock there, for of course all the countries at war suffered losses comparable with those given above.

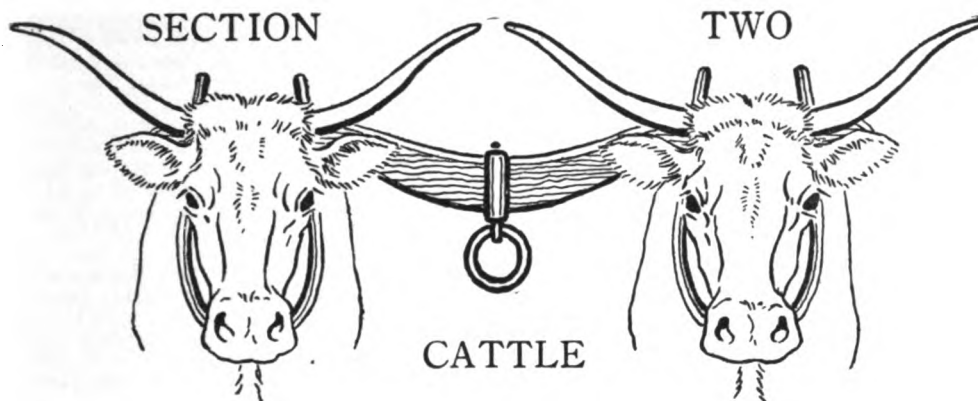
As far as the United States is concerned, its horse and mule losses were slight (42,311 animals up to December 25, 1918) but the war greatly stimulated its export trade in draft animals. Thus the number exported increased from 33,451 in 1913 to 355,128 in 1915, to 469,468 in 1916, and by December 31, 1918, reached a total of nearly 1,400,000, of which about one million were horses. In addition there was, with the American Expeditionary Forces at the end of December, 1918, a total of 191,631 draft and pack animals.

The future for draft horse production in the United States for the immediate future and for some years to come is encouraging. The shortage of horse power in both the cities and the farm country of European nations, where during and immediately after the war the price of horses was much higher than in the United States, has provided a strong demand. Moreover, the world need of food makes more intensive cultivation imperative in the United States as elsewhere, even if the automobile*truck tends to limit the market in the larger cities.

More than four fifths of the horses in the United States are kept on farms, and there is yet no economical or entirely satisfactory substitute for horsepower there. The tractor is not adapted to all kinds of farm work, nor can it always be used under soil conditions likely to exist during a considerable period of the year under normal rainfall and winter conditions. The small tractor is gaining in favor but as a supplement to, rather than a substitute for, farm horses. In this way it aids in a more intensive cultivation, serves to increase the total motive power applied on the farm, and to increase production accordingly; but it does not and will not displace much of the horsepower required.

The prevailing higher prices for horses and for all farm products and labor will exert a marked influence toward the improvement of horse stock, that the horses used in farming may be more efficient and more profitable.





CHAPTER 5

The Care of the Dairy Herd

By HUGH G. VAN PELT, who has been practical farmer, herdsman, teacher, judge of cattle, state dairy expert, and editor and who is to-day known to dairymen the country over as one or more of these. In 1904 he had charge of the Jersey herd at the St. Louis World's Fair. At present he is connected with the publishers of some of the best dairy journals, and is president of the Waterloo Jersey Farm—a practical and successful farm enterprise.—EDITOR.

SUCCESS in any business requires knowledge and practice of certain rules and principles. Dairying is a business; the farm and buildings may be likened to a factory, the herd to its machinery. Both must be well managed. Four vital factors are:

Grow most of the feed. Raise all the food stuffs that can profitably be produced. Of course climate and soil conditions as well as the amount and cost of labor needed may make it necessary to sell some crops and buy others to balance the rations, but try to keep the balance on the farm's side.

Supply comfortable surroundings. Good pastures, dry, well-drained, and sheltered barn lots and comfortable, clean, sanitary, well lighted, and properly ventilated stables are essential. Fresh air and sunshine are as necessary as food and water—and much cheaper. Barns running north and south are desirable, since large windows on the sides admit the greatest possible amount of light and purifying sunshine, and doors at the ends permit cooling draughts in summer.

Ventilate the barn. The King system in some form (see Vol. III) is advisable. If not practicable, muslin sash should take the place of glass in a number of windows. At any cost the cattle must have fresh air at all times.

Make it convenient. Remodel old barns or build new ones with convenience as the primary object. Labor-saving equipment ultimately means a saving of money as well as labor. (See below and Vol. III).

How to Start; Selecting a Herd

It is better to *grow* into dairying than to go into it; therefore the inexperienced man had better start with grades, studying them and gaining experience before sinking his money in purebreds. When the time comes,

let him buy these one or a few at a time, raising only the best calves and gradually weeding out the older and poorer animals.

Which breed? This question is of less importance than the selection of good individual cows. There are good and poor animals in every breed, and the best in any of them is

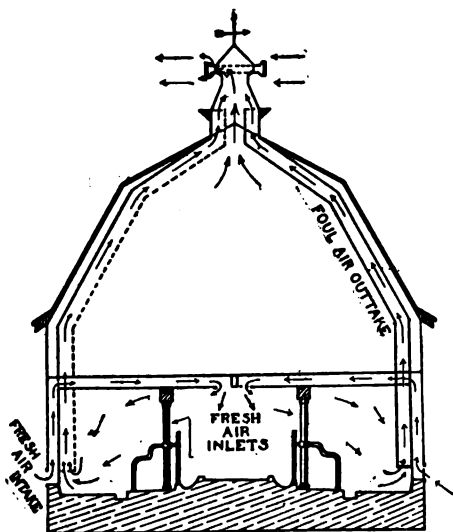


FIG. 47. Section through a barn showing a typical ventilating system. The fresh air inlets and foul air outlets, spaced several feet apart, alternate along each side.

better than the poorest in any other. Jerseys and Guernseys produce less but richer milk than Holstein, Ayrshire, and Brown Swiss cows. This is one truth; the other is that one is most likely to succeed with the breed he likes best.

How to know a good cow. No amount of care or feeding will make a poor cow profitable; therefore buy only good ones, if possible those of which the milk and butter fat production for a year is known. If such are out of the question, choose animals that show characteristics related to good performance, then use scales and the Babcock test (Chapter 40) to find out which should be kept as milkers and for breeding and which should be disposed of. A cow to be productive must be well developed in every essential point. She should have a large mouth; large, open, distended nostrils; fair length from muzzle to eyes, which should be large, bright, and prominent, separated by a broad, well dishd face; ears of medium size; horns small and incurving (or otherwise according to requirements of the breed); her neck clean-cut, long and thin; conformation wedge-shaped; withers pointed with the back bone refined, but prominent, open jointed and straight from the shoulders to the tail setting; depth in the chest and heart girth; and well-sprung, flat and deep ribs. Her hide should be supple and elastic and her hair soft and silky, indicating quality and strength of constitution and digestion; she should be broad and strong across the loins, and between the two prominent hip bones, and straight and long from these points to the pin bones, on each side of the tail setting; her legs should be of medium length, and her thighs thin and well arched out, giving room

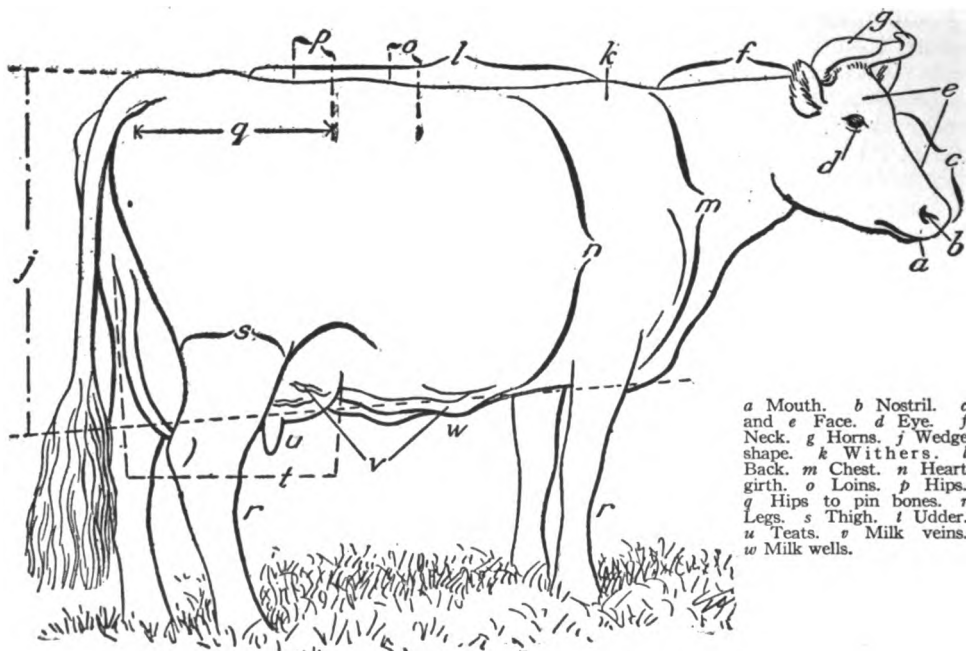
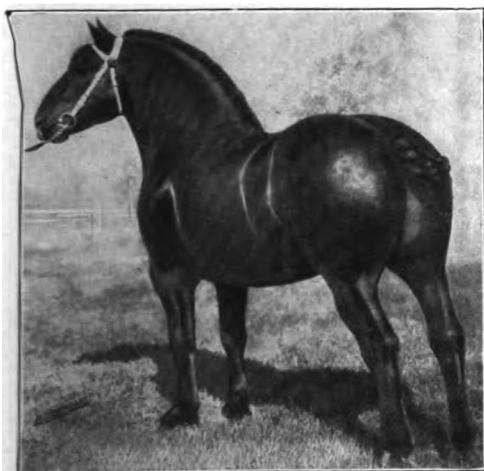
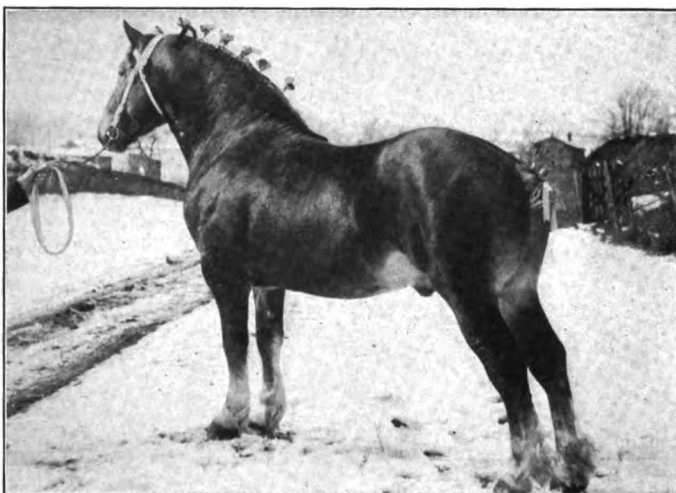


FIG. 48. Points of a good dairy cow (see text)

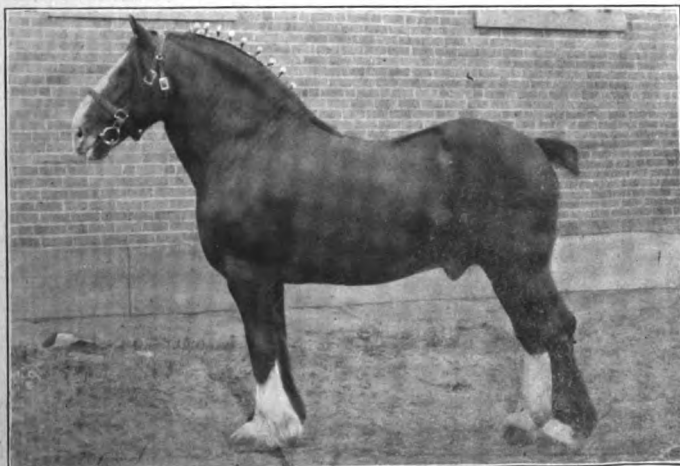
**THE LEADING THREE
DRAFT BREEDS IN
AMERICA**

A Belgian stallion



A Percheron stallion

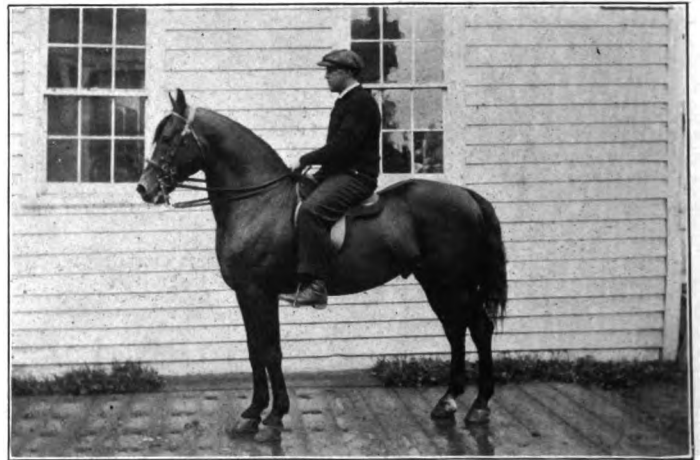
A Clydesdale stallion





**THREE BREEDS OF
HORSES MADE IN THE
UNITED STATES**

**The American Saddle
Horse (photograph by
Geo. Ford Morris)**



The Morgan



The Standardbred

for a highly attached, broad udder, which should extend far forward along the underline. A large udder insures a large yield, providing it is of good quality as shown by soft, pliable skin and short, silky hair. The four teats should be good sized and well placed, one at each corner; passing forward from the udder should be two large, long, winding milk veins, ending in large, open milk wells. With these characteristics a cow, if well bred and healthy, given good care and an abundance of feed well balanced for milk production, should be productive and highly profitable.

The same points apply in selecting purebred cows but the task is simpler because a study of their pedigrees will show the type and performance of her ancestors (which is all a pedigree can do). It is always better to select a good cow blemished than a poor cow sound. Purebred cows that have lost one quarter of the udder by accident are often much more productive than grades, can be purchased as cheaply, and wise dairymen are always on the lookout for them. They make an excellent foundation on which to build up a purebred herd.

Choosing the bull. Some farmers use bulls merely to freshen cows and beget calves. Good dairymen insist in addition that such calves shall be better animals than their

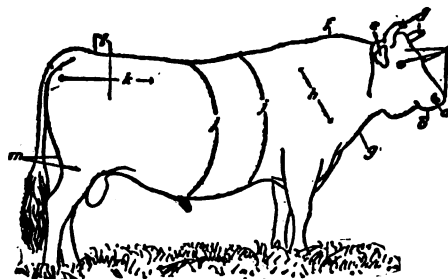


FIG. 49. Points of a good dairy bull (see text). *a* Nostril. *b* Mouth. *c* Face. *d* Horns. *e* Ear. *f* Neck crest. *g* Throat. *h* Shoulder. *i* Heart girth and barrel. *j* Hips to pin bones. *k* Width of hips. *l* Thighs.

parents, and therefore demand that the dam and grand-dam of the bulls they use shall have been highly productive cows of the right type. The bull himself must have quality, healthy, and rugged "maleness" standing out all over him, *and* be a purebred. A grade bull may transmit characteristics of a distant ancestor worthless as a dairy animal, and so defeat the purpose desired. Better sell some of the poorer cows and buy one good bull with the proceeds, than keep a grade at the head of a herd of good females.

Practical Care of the Herd

Good farm, good barns, good cattle—all these profit nothing unless good, practical management is added. There are many systems; here is one which if followed intelligently *will bring success*.

The care of the cow. Feed each cow as an individual as far as possible according to her daily needs, condition, and desires. Cows differ greatly from time to time and one from another, just as people do, and the cow that does the best is the one that is most comfortable and best satisfied. Simple plans for convenient individual feeding, any one of which is far better than the usual, careless, wholesale way, are as follows:

1. Build a row of covered boxes each large enough to hold a week's rations, along the wall in front of the cows (or in some equally convenient place). Weigh up the feed for each cow once a week, then feed her with a small scoop giving just what she will clean up eagerly at each meal.
2. Keep a small box on a shelf over each cow's manger, to hold a day's ration which is weighed out for each cow at the least busy time of the day.
3. Divide a feeding wagon into compartments each to hold a different grain, and attach a spring scales so that each ration can be weighed and mixed as fed.
4. Use the small boxes as in (2) but instead of keeping them over the mangers arrange them on a wagon that can be kept in the feed room except at feeding time.

When the cow gets within 8 weeks of freshening begin drying her off. As soon as she is dry, begin feeding her well, for it is during this period that the unborn calf makes its largest growth and the cow prepares to freshen properly and do a large year's work. Give her 3 pounds of corn silage and one pound of clover or alfalfa hay for each 100 pounds live weight, and from 6 to 10 pounds daily of a ration consisting of one part ground corn, 2 parts ground oats, 1 part bran and 1 part oil meal, gluten feed, cottonseed meal,

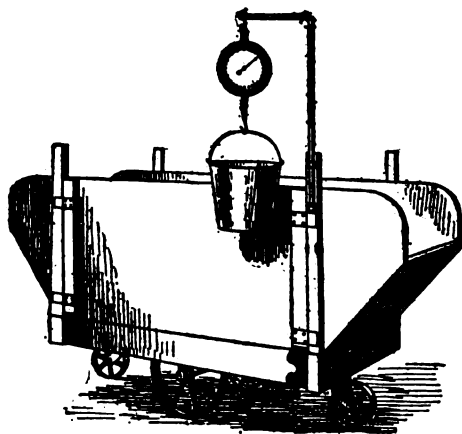


FIG. 50. A handy feed truck with removable body and scales for weighing each cow's ration

or some such protein feed. A week before freshening reduce the ration somewhat and 3 days before she is due begin to give her twice daily a warm mash consisting of a pound of bran, a pound of ground oats, a pound of oil meal and a small handful of salt. Continue this for 3 or 4 days after calving to put her in good shape. At this time, or sooner if the inflammation has left the cow's udder, remove the calf and resume the feeding of dry grain in addition to the silage and hay. The cow is still in a weakened condition, however, and should not be fed heavily, nor need she be, for the preparation she has received has put a surplus of fat on and in her body, and this she can now draw upon and turn

into milk and butterfat if the ration is light and stimulating. Five pounds of the above grain mixture given daily is enough to start with. Increase the ration by half a pound every other day, so that the cow will be on full feed within 30 days after freshening. If she is responding satisfactorily she will be yielding abundantly at the end of the first month and will have declined very perceptibly in flesh. It is very necessary to weigh the milk regularly to find out how the cow is responding to her feed. If she does not respond as she should change the ration by increasing the percentage of the protein feeds. To keep up her strength and condition so that she can continue her good work, increase the percentage of carbonaceous foods such as corn, hominy feed, barley, and ground oats. Always bear in mind that the first 60 per cent of the feed a cow eats is used for maintaining her own body and its activities and only the remainder goes to make milk. Thus only liberal, intelligent feeding can result in profitable production.

If the cow is to freshen in the summer, grass may be substituted for the hay and silage, but it is always advisable to have her freshen in the fall when there is time to give her plenty of care, when prices for dairy products are high, and so that the cow will do her best during the winter and then increase her milk flow when she goes to grass in the spring.

You can greatly increase the milk flow, *but not the richness of the milk* by feeding. However, it is possible to decrease the richness by feeding too sparingly, or subjecting the cow to uncomfortable conditions. Therefore, it is wise to feed abundantly and protect the cow against severe cold, great heat, and troublesome insects; to stable her in a cool, well ventilated, screened or darkened barn in the daytime in midsummer; and let her go to pasture in the cool of the evening. When cows are stabled, feed them green soiling crops or, what is more economical, summer silage. When the cow has been giving milk for about 3 months she should be re-bred, then again dried off when within 6 or 8 weeks of freshening and the same plan of feed, care, and management started for another year.

Milking methods. To do her best a cow must be fed and milked regularly, treated kindly, and milked absolutely dry promptly and swiftly but without hurrying. The more milk obtained at one milking, the more may be expected at the next, because the extra stimulation of the milk-making glands encourages them to do their best. Twice daily is enough to milk most cows, but it will

pay to milk some exceptionally large yielders 3 times daily, thereby developing them into greater producers, and guarding against udder troubles.

The care of the bull. As good a grain ration for the bull as can be fed consists of 1 part ground corn, 2 parts ground oats, 2 parts bran and 1 part oil meal, of which in addition to a very small ration of silage and a large ration of hay, he should receive just enough to keep him in fair flesh and good condition. During the summer months he should have the run of a grass paddock or green feed supplied to him. Above all he should not only be given a chance but should be compelled, if necessary, to take considerable exercise, by placing him each day either in a lot with other bulls or in a tread mill with which to pump water or run a cream separator, washing machine, grindstone, etc. Though all dairy bulls are nervous animals, those that are properly cared for and well fed, and neither teased nor ill treated, should not become vicious.

Raising calves. Calves need much care and attention at all times during their first few months, but the large number thus saved from the ravages of scours and other diseases and their improved quality well warrant and well repay the extra effort. Leave the calf with its mother the first 48 hours, making sure that it is receiving the first milk, or *colostrum*, which is needed to start its digestive apparatus working. When taken away from its mother, it should be placed in a clean, well bedded, warm pen, where the sun shines and the air is fresh. If born in cold weather keep it carefully out of draughts. During its first 2 weeks feed it approximately 3 pounds of warm whole milk 3 times each day with regularity. When 2 weeks old it will nibble at bright clover hay, if given an opportunity, and also begin to eat grain. After drinking its milk, it should be offered a handful of a grain mixture consisting of cracked corn, whole oats, bran, and oil meal; a little should be placed on its tongue at first to teach it that grain is palatable. At this time, too, skim milk may be gradually substituted for whole milk, letting the change take 2 weeks. Increase the amount of milk gradually, always taking care not to overfeed, until the calf is receiving daily from 12 to 15 or 20 pounds of warm, clean, skim milk, but *never more than 20* by the time it is 5 months old.

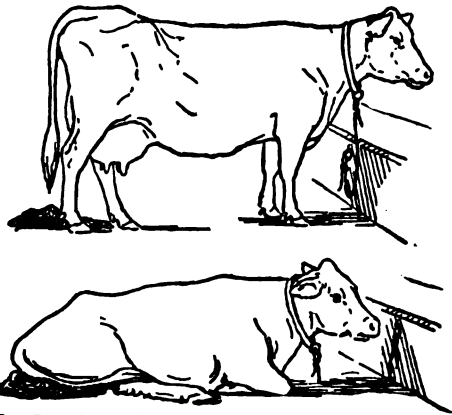


FIG. 51. A cow tied loosely on a flat floor soon becomes filthy as shown here. But—

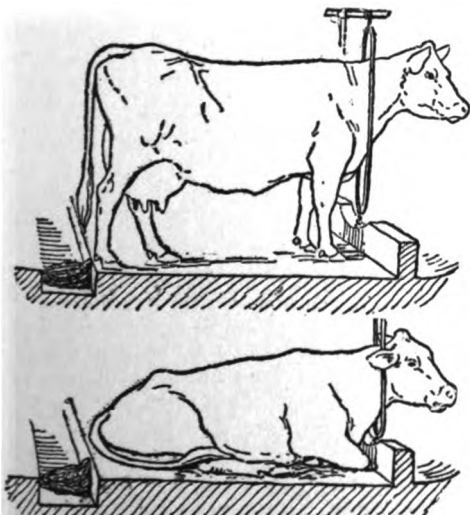


FIG. 52. Stanchions, whether of wood or metal, a short plank and a gutter, keep her clean and give her just as much comfort.

Calf scours (diarrhea) is often troublesome. When it first appears, reduce the amount of milk and give a corrective such as a tablespoonful of castor oil. To guard against scours, it is well to add to each feeding of milk a teaspoonful of blood flour which can be purchased from packing houses. Another advantage in this practice is that blood flour contains large percentages of protein and bone phosphates, which greatly stimulate the growth of bone and muscle. If the calf has grown well, it may be weaned when 6 months of age. When grass is good, the calf should be permitted to graze, but during its first year the grain ration should be continued. The dairy bull calf never grows into a good steer, so if a grade, and therefore unsuitable for breeding purposes, he should be vealed as soon as old enough. When winter comes continue to give the heifers a grow-

ing grain ration and encourage them to consume large amounts of clover and alfalfa hay, corn silage, and stover that they may grow well and develop large digestive capacities. They need not be stabled closely; in fact they will thrive as well and make better cows if they are given a clean, well bedded, open shed to run to for protection from cold winds and storms. If of the smaller breeds they should be bred when 15 or 16 months of age, but if of the larger breeds they had best be left open until 18 months old. They should be well fed and cared for up to time of freshening, when their feed and management will be the same as that suggested for cows, ex-

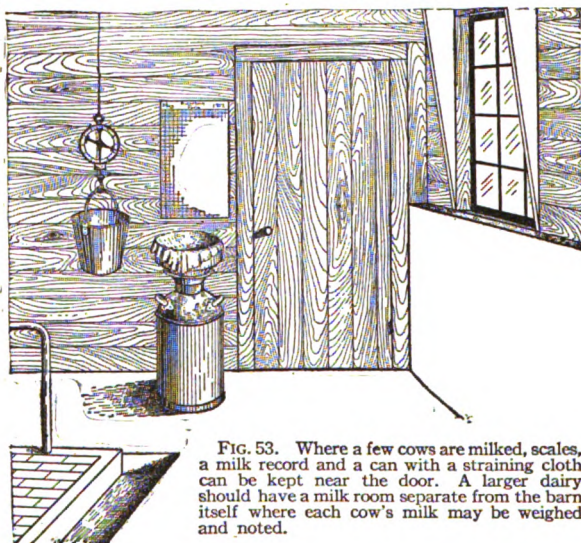


FIG. 53. Where a few cows are milked, scales, a milk record and a can with a straining cloth can be kept near the door. A larger dairy should have a milk room separate from the barn itself where each cow's milk may be weighed and noted.

cept that special care should be taken in breaking heifers to milk in order that they may not be encouraged to kick, fight, and become useless cows.

Why and how to keep records. Not all heifers, even though from good sires and good dams, grow into profitable cows. It is therefore advisable to keep records of their feed and production. This can easily be done by keeping feed record sheets close to the scales at the feed bin and milk record sheets near where the milk is strained into the can. Both kinds can be cheaply purchased or made at home, the former with columns running across the sheet for each day in the month and lengthwise columns each labeled with the name of a concentrated feed used. So seldom is the feed changed that keeping feed records is very simple, though of great value. Milk sheets carry a lengthwise column for each cow in milk and cross lines leaving spaces for morning and night yields for each day of the month. When the cow's milk is weighed only a fraction of a minute is required to jot down the amount. By watching the milk sheets you can discover variation in production and by adding the columns at the end of the month, the production of each cow and her value compared with that of the others. Wherever milk can be sold on a butter fat basis, the true worth of a cow can be found only by regularly testing the quality of each cow's milk by the Babcock test (Chapter 40) as well as weighing it.

The Dairy Herd and the Show Ring

In exhibiting his cattle the breeder comes in touch with many other dairy-men and breeders. If successful in the show ring, he gains advertising that results in a ready demand, at good prices, for all surplus stock. The knowledge gained of the deficiencies of his cattle is of great value for he goes home resolved to breed better animals and fit them more efficiently. Thorough preparation over an extended period is an absolute necessity. Much time and labor and some expense are needed to bring even the best animals out in winning condition, as must be done if possible. The breeder's purpose will be defeated if he shows his cattle in poor condition. By following the suggestions for breeding, feeding, and caring for his animals outlined in this chapter he will have taken the most essential steps in fitting cattle to show. From his herd he will need to pick the best animals to fill each class. All fairs print in their catalogues base dates from which ages are reckoned. It is well to show animals as far along in age as possible, and yet get them in the classes that are to be filled. Cows and heifers of milking age should not have been fresh longer than 3 months nor less than 3 weeks.

Fitting. Assuming that the best animals of the herd have been selected with regard to breed type, individual excellence, age limit, and date of freshening, and that feeding methods have been such that the individuals are in good flesh and not too fat, the other details of bringing out a winning herd may be summed up as follows: Shows and fairs occur in the fall; during the preceding hot summer months special care must be given. Keep show animals in cool, well ventilated barns with well bedded stalls during the day, turning them out at night to graze and exercise. Groom them thoroughly daily with a soft brush and flannel rag saturated with a mixture of equal parts coal oil, glycerin, tanner's oil, pennyroyal, carbolic acid, and sulphur, to bring the oily secretion, soften up the hide and hair, and keep away flies. Thirty days before the show it is a good idea to clip all hair from the belly and udder to bring into pleasing prominence the milk veins and wells. Extra hair on any part of the body mars the looks of the animals and should be carefully clipped off at this time. As show time approaches, many details demand the exhibitor's attention. All charges should be well broken to lead and stand in a good position while being shown. Horns should be trimmed and rasped into proper size and shape, polished, and, if many shows are to be made, horn covers provided to prevent them from becoming scratched. Animals whose feet have grown into improper sizes and shapes, which is often the case with aged bulls, should have their hoofs trimmed by using a sharp chisel and shaving off the bottom of the foot instead of just the toes.

If animals must be shipped to reach the show, care must be used that they do not lose condition in shipping. Grain rations should be reduced slightly two days before loading animals on cars. They should be fed a light

ration of bran; ground oats, and oil meal in conjunction with hay of good quality while on the way. Calves should have milk regularly in lesser amounts than when at home. If the weather is hot, water must be supplied in limited amounts in the car. It is well to have succulent feeds such as roots, silage, or green feeds available when the animals are unloaded, for they readily eat well of these even in strange places. Care should be taken not to allow the cattle to gorge themselves with strange water and feed which should be supplied lightly the first day. It is well to arrive at the show 3 or 4 days before the cattle are to be exhibited, that they may rest and fill.

The final task is that of presenting the animal in its best light to the judge. Many judges work too close to their animals and sometimes overlook good ones in that way. If one has a good individual it is well to make sure, by reaching the ring early, that the judge receives a proper impression of the whole contour of the animal. When one is showing an animal with faults it is better to be less showy with it. A herdsman can seldom improve on nature, providing the animal is well fitted and trained; his chief duty is to keep the animal showing at its best, with its feet well under it and in its most imposing condition.

When one knows the characteristics an animal must have to be pleasing to a judge he can very easily train his charges to show free from many faults which, though not commonly present in the animal, may develop in the

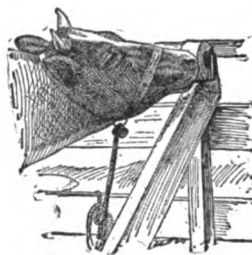
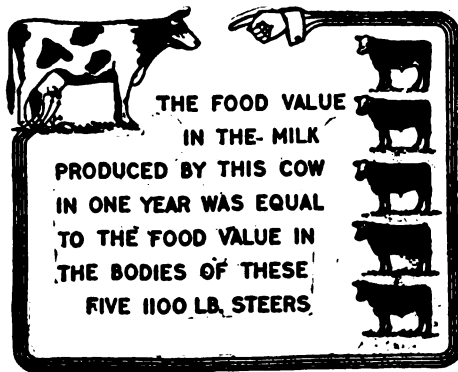


FIG. 54. A good salt brick and holder for dairy cows



Courtesy International Harvester Co.

show ring under strained conditions. On a long circuit of fairs it is difficult to hold ani-

mals at their best for each show, but by keeping on hand a good supply of succulent feeds, taking care not to feed too much corn and other heating feeds, exercising the animals freely, and keeping stalls well bedded and clean, the herd may be kept in good shape.

There is no need of harming the future dairy usefulness of show animals, providing they are carefully fed, properly shown and when taken home placed on a ration that will reduce all soreness and fever caused by shipping and showing.

He who wins achieves the success for which he has labored. He who loses should lay aside all prejudices and profit by the lessons the show ring teaches. He should look for his mistakes instead of abusing judges. Above all he should not get discouraged, but should resolve to profit by his mistakes and try again; in the end success will crown his efforts.

The Dairy Herd as a Source of Profit

The dairy herd, and more particularly the dairy cow, is a source of profit in at least five ways. (1) As a source of food for the farmer's table it should receive greater consideration and greater care than it oftentimes does. In cities men are finding that milk, even at 10 cents a quart, is as cheap a source of food as eggs at 15 cents a dozen, fish at $3\frac{1}{2}$ cents a pound, chicken at 5 cents, beefsteak at $13\frac{1}{2}$ cents or pork chops at $22\frac{1}{2}$ cents. Yet farmers can make milk for less than four cents a quart. Surely here is one way to lower the cost of living.

(2) Under the right conditions the surplus milk products, above those used on the farm, are a source of regular, reliable profits. The market for dairy products has never been controlled by a few; it never will be. Through cooperative creameries and cheese factories farmers can supply a staple, finished product, ready to be handed direct to the ultimate consumer if necessary. Once a month, a week, or even a day, the dairyman may receive payment for the work his cows have done for him. Thus he can pay cash for what he buys and stand from under when panics and hard times threaten.

(3) The herd thus provides a sure, prompt, and profitable market for grains and roughage grown on the farm. And at the same time it is conserving and even improving the fertility of the soil. Land that supports good dairy herds becomes richer and richer each year; unless *very* carefully managed, land devoted to raising grains and grasses for market becomes poorer. The reason is that every ton of corn sold off the farm, worth in normal times \$20, takes with it \$6.50 worth of plant food; every ton of wheat worth \$35 takes \$7.50 worth; every ton of beef, worth perhaps \$200 takes \$17 worth. But every ton of butter worth more than \$600 takes only 49 cents' worth of plant food! And meanwhile the herd returns to the soil in its manure many times this much fertility.

(4) Purebred stock costs no more to keep than grades, but it gives as much if not more milk and butter fat, and both young and mature animals when sold bring a great deal more money if of the right quality. Raising purebreds is a business separate from dairying but the dairy cow is a source of profit in each.

(5) The dairy cow is a home builder. Farming, no matter how profitable, will never reach the position of dignity it deserves until the farm home becomes so attractive that it will be the pride of the family, to be handed down from generation to generation. The dairy herd always has stood and always will stand as a symbol of the good farm, the real farm home.

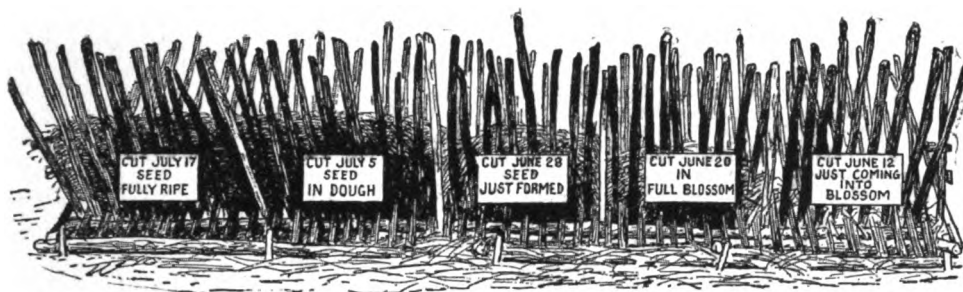


FIG. 55. Cut hay for cattle early. These racks were filled with hay cut at different stages, and cattle were allowed to eat as they chose. They cleaned up the youngest but ate less and less of older cuttings. (Bul. 235, Pa. Dept. Agr.)

CHAPTER 6

Systems of Beef Production in America

By W. H. PEW, practical farmer and stock raiser, and judge of beef cattle; member of the Executive Committee of the Iowa Beef Producers' Association. Formerly Chief of the Department of Animal Husbandry of the Iowa State College. And his former associate PROFESSOR K. C. IKELER who was graduated from the Pennsylvania State College where he made a special study of beef production. Since then he has been with the U. S. Bureau of Animal Industry, has managed Shorthorn herds on several show circuits and has been in charge of the Live Stock Management at Iowa State College since 1915. Being in the centre of the corn belt, Iowa is the state from which one would expect the most accurate, practical information about beef production. In view of their knowledge of corn belt conditions, their experience, and their familiarity with the needs of farmers who want to know, Professors Pew and Ikelier are especially fitted to handle the subject.—EDITOR.

FOR some years the world's population has increased faster than the beef supply until to-day there is a world's shortage of beef. As a result there has also been a slow but steady increase in the price of both market and purebred cattle, so that at present no class of live stock offers greater possibilities for profit than beef cattle. Beef production on the farm makes use of rough untillable land, converts grass and coarse feeds into a concentrated salable product, pays better than the usual market prices for feeds, maintains and increases soil fertility, helps solve the farm labor problem, is profitable by itself, and fits in well as a part of the whole farm business.

Beef is produced either (1) on the open range on a large scale where great numbers reduce expenses and make up for moderate or small returns per head; or (2) on the farm (in the feedlot) where a heavier investment for buildings, feed, and care is required, but where greater size and finish can be put on each animal. Their lines may also be combined, the range supplying calves as "feeders," and the farm giving them their market development and bloom. On the other hand the purebred sires used to produce feeders both for range and feedlot, come mostly from farms, where the intensive breeding operations and later care necessary for the developing and fixing of animal characteristics and quality can best be practised.

Beef Cattle on the Range

In the past the range territory lying west of the Missouri River has offered an abundance of cheap land well adapted to beef production; on which grass fattened and feeder cattle have been raised at a splendid profit. As the West

has become more thickly settled the lands available for cattle have been reduced and large numbers of cows have been sent to market. However, the ranches of the West and the Southwest still hold an important place in

the production of beef cattle. They have introduced large numbers of purebred bulls and developed cattle of more approved market type, better quality, and earlier maturity. The Herefords or "White Faces" have always been very popular upon the range, having the size, constitution, and rustling ability that produce a large amount of beef from grass alone. The Shorthorn has also been used extensively and with excellent results in the improvement of range cattle. In recent years a great many Aberdeen-Angus bulls have been taken to the West and especially the Southwest to improve the range cattle.

Under range conditions the cattle are grazed through the summer and fall entirely upon grass, some bottom land being set aside for the production of wild and tame hays for winter feeding. The bulls are usually turned with the cows about June 15 to July 1. In the fall the cattle are taken up, and the calves (born in April from the previous year's mating) are weaned, branded, and the bull calves castrated. The calves are then given the protection of a shed or perhaps a good windbreak and fed liberally upon alfalfa or other good hay. The cows are also given the protection of a windbreak and fed upon hay throughout the winter, or perhaps grazed upon winter pasture. Calving usually begins in April and continues until the new calves, yearlings, and cows are turned on to the summer range about the first or middle of May. In many grazing sections cattle are shipped in by the train load and pastured there only during the summer.

Range cattle are usually sold as 2 or 3 year olds and reach the markets as grass fed cattle

in large numbers in the fall. The fattest of them are bought by the killers for immediate slaughter, while the thinner ones are resold to corn belt farmers as feeders.

	ON RANGE	ON FARM
Acres of pasture needed per head	10-20	1-3
Value per acre of such pasture land	\$1-\$10	\$40-\$150
Average daily gain during grazing season	1½ pound	2 pounds
Average daily gain of corn fed steers in feedlot	2½ pounds	2½ pounds
Cost per 100 pounds to produce	\$5-\$6	\$10-\$12

The accompanying figures show clearly that farm conditions involve a heavier investment in land; but the farm raised steer is usually of a little better quality, larger size and higher condition, all of which factors command a higher price on the market. On the other hand the smaller and less valuable gains made on the range are much cheaper to make. On the whole the difference in net returns from the two systems is not great although range cattle are produced at the lowest cost. Nevertheless the reduction of available cattle range by homestead and dry farming has decreased the supply of range and feeder cattle and greatly increased their price.

Beef Production in the Feedlot

This has been most extensively practised in territory lying next to the range country, where land is relatively high priced, corn the principal crop, and the acreage in pasture relatively small. In the past a large percentage of the cattle fed in the central and eastern states were bred and raised on the range and shipped east to be fattened. The profit in cattle feeding comes not only from skilful feeding and handling but also from keen and good business judgment in buying and selling. In late years this form of beef production has become less profitable because of the price and scarcity of feeders, the high cost of feeds, the narrow margin of profit and the unstable condition of the market. The selection of the kind of cattle for the purpose will depend upon the length of time they are to be fed, the time of year, the feeds used, the markets and the experience of the feeder. The most important point is that the cattle shall be of the right type, and uniform. The most profitable feeder steer has a wide, short head; large, mild eye; strong jaw; short neck; deep, wide chest; strong back, a depth of middle indicating feeding capacity, and a reasonably full hindquarter. He should have short legs and be free from coarseness in the head, shoulder, hips, hide, and bone. Thickness of natural flesh in the region of the high priced cuts, namely crops, loin, and round is a most important item. If a buyer can select feeders of this type, but thin, he is insured of a top price for the cattle when fat. If he desires and plans to feed a

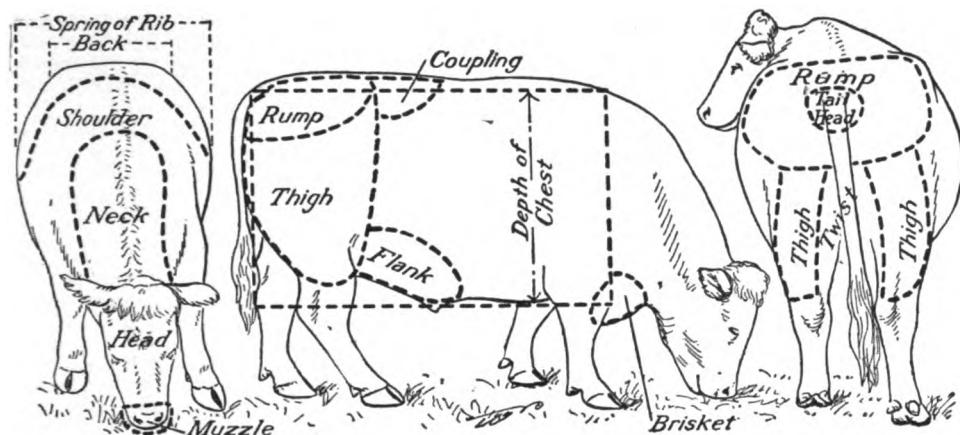


FIG. 56. The parts of a beef animal in which the highest development is wanted, as seen from front, side, and rear (Bulletin 224, University of Wisconsin)

relatively large amount of grass or roughage he should select older and thinner cattle weighing about 1,000 pounds each.

Feeding systems. Two methods are followed in feeding cattle: In short feeding, comparatively heavy, fleshy cattle are given a heavy grain feed for 80 to 100 days. In long feeding lighter and thinner cattle are fed for 120 to 150 days, and more roughage and less grain are employed than in the other method. The usual plan is to start the steers upon rough cheap feeds such as pasture, hays, silage, fodder or stover (thin but good sized cattle will make cheap and fairly large gains for the first month or 6 weeks upon these feeds alone). From 3 to 4 weeks are usually needed to get cattle on full feed, those on a short feed programme being brought to full feed more quickly than the others. Great care must be exercised during this period not to feed too heavily and so get the cattle off feed. The usual farm practice starts with 4 or 5 pounds of corn daily per 1,000 pounds live weight. As the feeding period progresses and the cattle become fatter the amount of grain should be increased and the roughage decreased, the idea being to keep the feeds just a little bit better than the cattle. When good roughages such as silage, clover, or alfalfa hay are available and corn is high priced, it may pay to limit the amount of corn to 8 or 10 pounds per head daily. Two pounds of cottonseed or oil meal daily per 1,000 pounds live weight cheapens the ration and produces larger gains.

Raising Calves vs. Buying Feeders

The narrowing of the range territory resulting in the high cost and scarcity of desirable feeding cattle, and the narrow margin of profit in finishing them has led many farmers to produce their own cattle. This requires that a herd of grade beef cows be kept on the farm and bred to a good, purebred bull. If properly handled such cows may be grazed on cheap, untillable land or on acreage subject to spring overflow, and kept over winter on coarse unsalable fodder—straw and hay—together with a little grain toward calving time. This plan works in well with the average farm activities, produces large amounts of manure

which produce larger crops, and provides steady work for the farm help throughout the year. It enables the cattle man to be independent of the feeder market which cannot always be depended upon; it gives him more uniform cattle of higher quality than he can possibly buy; and it saves him the worry, shrinkage, and expense involved in buying feeders. However, compared with the buying and finishing of feeders, it calls for a larger acreage of land, especially of pasture, to accommodate the breeding herd. Also it makes necessary greater crop production that there may be plenty of feed with which to carry along the brood cows and grow and fatten the calves. Finally it requires regular,

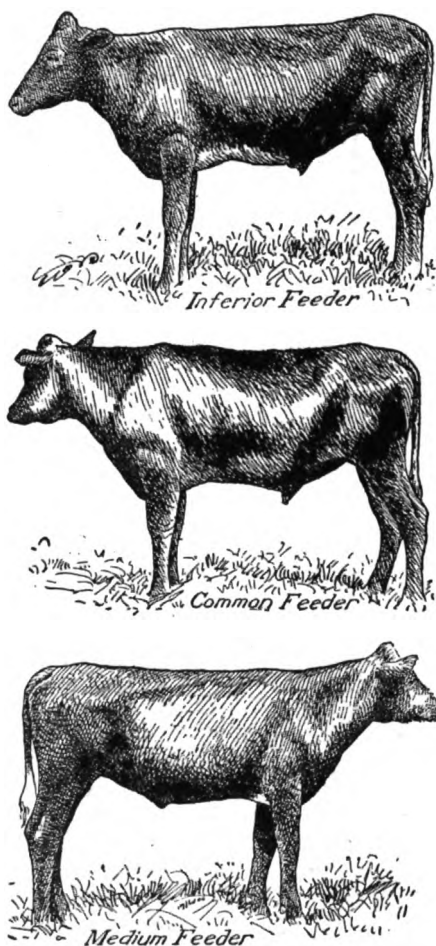


FIG. 57. Types of feeder cattle, poor to medium

uniform labor the entire year and a greater and more continuous investment which, in turn, involves a greater financial risk.

Young vs. Old Cattle—Baby Beef Production

The high cost of land and feeds has caused feeders and breeders to emphasize early maturity in their cattle. It has been demonstrated that cattle make their cheapest gains during the first year or 18 months. The larger, older, late maturing steer has become relatively unprofitable because of the great overhead expense of maintaining him until 3 or 4 years of age. Early maturity has been obtained by selecting the shorter legged, more compact type carrying greater thickness of natural flesh, which has proved profitable to producer and consumer alike. Strictly speak-

ing baby beef making is the production of choice fat cattle between 12 and 24 months old weighing from 800 to 1,200 pounds apiece. This means that they must be fattened while growing; that only well bred calves of good early maturing quality are suitable; that these calves must suckle their dams and be full fed from birth to market upon the best feeds. Finally an experienced feeder and good business judgment are necessary if the greatest possible profit is to be obtained. This plan usually means that the cattleman must breed his own cattle, as calves of uniform type and quality are difficult to obtain upon the market at any price.

This type of beef production is proving very profitable and becoming very popular with farmers under corn belt and eastern conditions. The cows are usually bred so that they calve in the early spring, the calves running with their dams on pasture during the summer (good pasture and fresh water are absolutely essential). In the pasture should be placed a creep where the calves may get cracked corn and perhaps a little oats, oil meal, or bran at any time. Calves so fed or pushed along will weigh 400 or 500 pounds at weaning time in the fall, when they must be taken up and continued on full feed of the best quality. Baby beefs cannot be roughed through the winter like feeder cattle. Alfalfa or clover hay or good silage are essential for the most profit, together with a good grain ration such as $7\frac{1}{2}$ to 10 pounds of shelled corn and 2 to 2 $\frac{1}{2}$ pounds of linseed meal (old process) or cotton-seed meal per 1000 pounds live weight per day.

In the spring the calves may be turned out to grass if good pasture is available, but they must still be fed a liberal ration of shelled corn and a little protein feed (oil meal, etc.) to supplement it. If good pasture is not at hand, the calves should be fed in a dry lot. Some calves in prime condition are marketed in August, but greater profit usually results if they are forced up until December. Everything considered, the Christmas market is about the best for baby beef, but the cattle must be in prime condition and of good, uniform quality to satisfy it.

Calves intended for baby beef are sometimes dropped in the fall. The disadvantages of this plan are that the cows are not on pasture during the suckling period, that consequently the calves do not do so well, and that the expense is usually greater. However, this plan shortens the feeding period since the calves are usually marketed the second winter or when they are about 15 months of age.

The popularity of baby beef. Baby beef is not only very popular with the producer and feeder but it meets the demands of the killer and consumer. With only a few exceptions market prices for the last 10 years have ruled higher for either prime fat yearlings or baby beef than for older and heavier cattle. Killers state that the cuts from baby beef are not only more tender and palatable but also,

being smaller, are in greater demand. The awards at recent fat stock shows give further evidence of the popularity of baby beef. Not since 1911 has a 2-year-old steer been made Grand Champion at the Chicago International; and, while this award has usually gone to a yearling, the 1916 Grand Championship was placed on a calf 13 months old. Most of the champion carload lots have also been of yearlings and young cattle have been consistent winners in the carcass contests. However, this does not mean that all beef should be furnished by way of the baby beef route. Upon the range and in the East and South, older cattle will probably continue for some time to furnish the great bulk of the beef supplied by those sections.

Beef Herd Management

Handling the brood cows. The females for the beef herd may either be raised or bought upon the market as thin heifers in which case they should be bred at 18 to 20 months of age. In any case they should be bred to a purebred bull of the correct, early maturing, thick fleshed type. The use of the purebred sire upon the grade herd is no longer an experiment, but an intensely practical means for getting the most profit. It results in an improved and uniform type appreciated by the market and obtainable in no other way. The bull sires 20 to 40 calves during the season and represents at least half of each; therefore have him right.

The greatest item of expense in raising a calf to weaning time is the cost of feeding the cow. This is lowest where pasture is employed and where the winter feed is almost entirely roughage; and highest where the cows are fed grain throughout the winter. During the first part of the winter the brood cows may be maintained upon meadow aftermath, corn stalks, and oat straw. Then, if possible, they should be put on alfalfa or clover hay or corn silage. A ration composed of 30 pounds of corn silage or 15 pounds of legume hay, 15 pounds of straw (preferably oat straw) and one pound of cottonseed meal is very satisfactory and should enable them to gain about a pound a day and be in excellent condition for calving. This ration will cost between 7 and 10 cents per head per day depending upon market prices, the cost of silage, and the locality. The use of silage makes it possible to carry a cow over winter on a considerably smaller acreage of crops than that required for grazing purposes during the summer. The cost of wintering a cow may be put at between \$12.00 and \$18.00. Pasture during the summer months is usually figured at from \$1.00 to \$2.50 per acre or from \$6.00 to \$15.00 per head per season. To these items should be added \$5 for bull service, interest on investment, and depreciation of breeding stock. The annual cost of keeping a

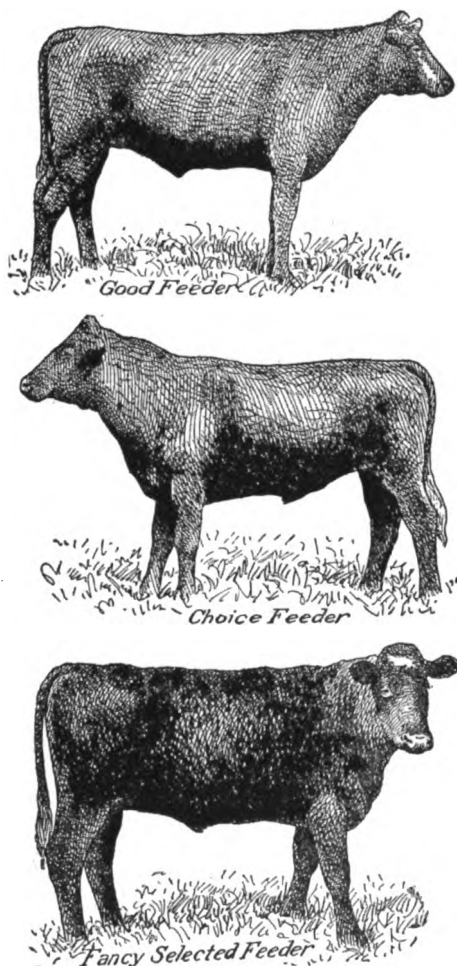


FIG. 58. Types of feeder cattle, good to best

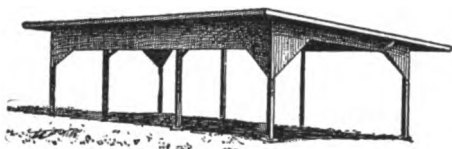


FIG. 59. Cheap shed to supply shade in a treeless field.

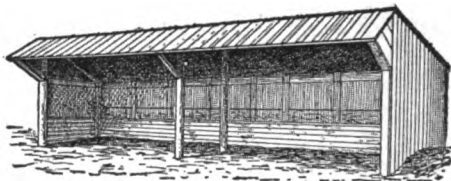


FIG. 60. Open shed for feeding and sheltering beef cattle.

cow would then range from \$18 to \$38 depending upon the method and feeds employed. The value of the manure may be allowed to balance the labor cost. The average high grade beef calf at weaning time is worth about \$45 which would indicate a very reasonable profit in producing calves on the farm.

Repeated tests have shown that a dry, open shed facing south and free from draughts is the most satisfactory shelter for wintering the breeding herd. That the cattle may keep comfortable and make the heaviest gains and that the farmer may save the manure and use it to best advantage, they should be kept well bedded. At calving time the cows should be given comfortable quarters with a little extra attention to make sure that the calf suckles and that the udder does not become caked. To get the largest returns for feed consumed, fattening cattle should be dehorned. If a saw is used, perform the operation when they are a year old, certainly before they are more than yearlings. A little caustic potash applied to the dampened skin over the horn buttons when a calf is a few days old, will kill the horns, but the use of a bull of a polled breed will dehorn the calves before they are born, that is, prevent the growth of horns. During the summer, pasture will be enough for the brood cows if it is good; if it becomes dry, the feeding of good legume hay or green corn is desirable. In the fall the bull calves should be castrated, the calves weaned and handled thereafter as outlined for baby beef.

The care of the bull. Since the bull is half the herd great care should be exercised in his selection, care and management. A common mistake is using a bull for heavy service while too young. Unless very large and well developed, he should not be used at all before he is a year old; as a yearling he may be allowed a limited number of cows; and as a two-year-old he should serve 35 to 40 cows and get good strong calves.

The same feeds suggested for brood cows may be used in feeding the bull, but he will usually need a little more of the concentrates and not so much of the roughness especially during the spring breeding season. The general practice in grade herds is to allow the bull to run with the cows. This gives him plenty of exercise, but a better plan is to keep him in an open shed with a paddock adjoining where he can exercise. The bull must be kept in a thrifty condition on muscle-building feeds, but he must not be permitted to become too fat; also a bull that is a sure getter of good calves should not be disposed of after one or two seasons of use but should be retained as long as he is useful.

Following cattle with hogs. The high price of feeds, the narrow margin in feeding cattle and the unstable condition of markets urge cattle men to use corn more economically. One solution of this problem is to let hogs follow the cattle to consume the large amount of undigested corn passed in the feces of heavy fed cattle. Many practical feeders do not always make a profit from their cattle, but they seldom fail to realize a reasonable profit from the hogs that follow them. A bushel of shelled corn when fed to a steer will usually produce about a pound and a half of pork on the hogs following in addition to any gain in beef. One hog weighing about 100 pounds when placed in the yard, to each 2 steers is about right. Thin, light hogs usually give better results than older, heavier, fatter ones. A

common practice is to remove such hogs when they get fairly fat, finish them on a heavy corn ration, and replace them in the cattle yard with thinner, more active, and growthy pigs.

Fattening cattle on pasture. The foundation of profitable beef production is good pasture; properly supplemented with corn, alfalfa, or silage, it offers excellent opportunities for maintaining breeding herds or for finishing cattle for market. The pastures of the South offer special advantages in furnishing winter feed for all classes of cattle; those of Virginia and Kentucky especially—though there are many others—are especially noted as sources of grass that is sufficiently nutritious to fatten cattle for market without the need of supplementary high priced corn or other concentrates. Many northern sections are noted for their fat grass cattle that exert a great influence on the fall markets.

In many sections of the country the fattening or finishing of cattle on pasture with some grain in addition is becoming very popular. Such cattle are usually grain fed during the winter but if then turned upon grass without grain they usually shrink considerably. To prevent this continue the grain ration at about half the rate that was fed in the dry lot. Cottonseed or oil meal fed in small amounts, say a pound per head daily, usually increases the profit. Sometimes the mistake is made of turning fat cattle on pasture a short time before they are to be marketed. Such cattle usually shrink heavily while on pasture, ship badly, and sell to poor advantage, often as grass cattle; the benefit of the winter feeding is thus entirely lost.

Pasture, legumes, and silage. It is estimated that better care of pastures, the growing of more legumes, especially alfalfa, and the general use of the silo would double the beef-carrying capacity of most farms. Good pastures are required

CALENDAR OF BABY BEEF HERD MANAGEMENT

(FARMERS' BULLETIN NO. 811)

MONTH	FOR SPRING CALVES	MONTH	FOR FALL CALVES
July	Breed. Pasture bulls, cows, calves	Jan.	Breed. On silage 40 lbs.; cottonseed meal 2 lbs.; or silage 30 lbs.; corn stover or straw unlimited
Aug. and Sept. }	Pasture cows and calves	Feb. }	Same
Oct. and Nov. }	Pasture. Wean calves	Mar. and April }	
Dec.	On stalk fields, straw, meadow aftermath	May	Wean calves. On pasture
Jan.	On silage 40 lbs., cottonseed meal	June }	Same feed
Feb. and Mar. }	1½ lb. per head daily; or silage 35 lbs. Corn stover unlimited	July and Aug. }	
Apr.	Calves born. Same but cottonseed meal 2 lbs.	Sept.	On pasture with 1 lb. cottonseed cake
May and June }	Pasture cows and calves	Oct. and Nov. }	Calves born. Same feed
		Dec.	On stalk fields or meadow aftermath; cottonseed cake 2 lbs.

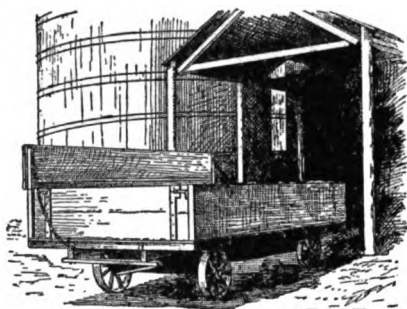


FIG. 61. Feed wagon for carrying grain and silage mixture to "bunks" or troughs. The hinged side prevents waste between wagon and silo.

for the growing of young cattle, alfalfa is a soil improver and a balancer of corn in the ration and the silo is essential for the best utilization of the corn crop. Silage furnishes a very cheap, efficient, palatable, nutritious, and succulent roughage for all classes of cattle. It is not a question of the beef producer not being able to afford a silo, but rather that he can't afford *not* to build and use one. It is not expensive and may more than pay for itself the first year it is used.

The Marketing of Beef Cattle

The marketing of his cattle is not the least of the beef producers' problems. The time of year at which cattle are placed in the feed lot has a direct bearing upon the time when they should be marketed. It so happens that most cattle are purchased or placed in the feedlots in the fall which means that most of the feedlot beef is marketed in the spring while a large percentage of the cattle marketed in the fall are grass fed. Cattle that are to be shipped to market should have their corn greatly reduced, or should be taken off pasture and fed on dry feed such as mixed or timothy hay, for a day before shipping. They should have what water they care to drink before loading, and plenty of bedding and dry hay in transit. When they reach the market they should be allowed to fill up on hay and water before being offered for sale.

In some states cooperative associations for the shipping and marketing of cattle have been organized. This plan is particularly adapted to sections where farmers raise a small number of calves each year and can with benefit combine their shipments and thus cut down marketing expenses. Such associations also have educational features which are of great value in any community that markets live stock in small lots.

Heifers and steers. In the past finished steers have been in greater demand and have sold for higher prices than fat heifers. It has been said that steer carcasses dress a little higher, and carry a little more thicker natural flesh in the high priced cuts. However, the few tests that have been made indicate that there should not be even 20 to 50 cents discrimination against open heifers. The one real objection against heifers is that they may be pregnant, which condition lowers the dressing percentage and may affect the value of the carcass. The spaying of heifers was formerly practised but the modern tendency toward early maturing cattle has practically made this operation unnecessary. In England heifers frequently outsell steers; as beef becomes higher in price and more expensive to produce the American preference for steers will also probably become less marked.



FIG. 62. Self feeder for beef cattle in the feedlot or at pasture. The overhanging roof protects the contents from rain (Bulletin 235, Pennsylvania Department of Agriculture).

CALENDAR OF MANAGEMENT OF SPRING CALVES

(FARMERS' BULLETIN NO. 811)

MONTH	TO BE FINISHED IN 15 MONTHS	TO BE FINISHED IN 18 MONTHS
March	Born. With cows. On grass or milk	
April	" " " " " "	
May	" " " " " "	
June	With cows. On grass or milk. Begin feeding shelled corn or cornmeal $\frac{1}{2}$ to 1 lb. per head daily	
July	Same, but cornmeal 2 lbs.	
Aug.	Wean. On grass or skim milk; chopped corn 2 $\frac{1}{2}$ lbs.	
Sept.	Vaccinate, castrate, and dehorn. On pasture; chopped corn 4 lbs.; silage and hay if needed	
Oct.	Continue vaccinating, etc. On pasture, chopped corn 5 lbs., silage 10 lbs.	
Nov.	Dry lot. Corn 6 lbs. cottonseed meal $\frac{1}{2}$; silage 8; clover 3; oat straw unlimited	Stalk fields, meadows; corn 4 lbs.; cottonseed meal $\frac{1}{2}$; silage 6; straw unlimited
Dec.	Same but corn 7, cottonseed 1 $\frac{1}{2}$, silage 10	Same but corn 5, cottonseed 1, silage 10
Jan.	Same but corn 8, silage 12	Same but corn 6
Feb.	Same but corn 9, cottonseed 2	Same but corn 7
March	Same but corn 10, silage 9	Heavy feed or pasture with grain. Corn 8, silage 12, cottonseed 1
April	Same but corn 11, silage 8	Dry lot. Corn 9, silage 14 (or pasture)
May	Sell. Corn 12; cottonseed 2 $\frac{1}{2}$	Same but corn 10, cottonseed 1 $\frac{1}{2}$
June		Same but corn 11, cottonseed 2, silage 16 (or pasture)
July		Same but corn 12, silage 15
Aug.		Sell. Corn 14, cottonseed 2 $\frac{1}{2}$, silage 12

Breeding Purebred Beef Cattle

The great demand for purebred bulls for the improvement of grade and market cattle has made this a very profitable branch of the beef-producing industry. The life of the purebred trade is based upon the selling price of beef. So long as market cattle command present prices it is reasonable to assume that the purebred business will remain upon a healthy basis. The breeder of purebred cattle should be a good judge, a good feeder, and a capable buyer and seller. His business requires a rather large investment in stock, equipment, advertising, good pastures and forced feeding to develop the young stock, and good business judgment in buying and selling. Many men are induced to engage in the purebred business before they can even handle grade cattle at a profit; such men are doomed to financial failure. The beginner should start with grades and grow into the purebred business rather than go into it. For the greatest profit, purebred calves must be fed, developed, and disposed of while young so as to reduce overhead expense for feed, equipment, and labor.

Feeding and fitting purebred calves. If calves are given the proper care during the first year they are half sold. Calves dropped soon after January first are usually the most satisfactory. A few fall calves in September

may be desirable for special customers or for show or sale purposes. In any case most of the calves should come at the same season of the year so that they can all be given the proper care without too much extra expense and labor.

The best calves are *not* grown on skim milk. Those from poor milking dams and all intended for show should be given nurse cows (this is the cheapest and best method of feeding a show calf). The cows with calves by their side may be allowed to run on pasture where there is some protection from heat and flies and a creep from which the calves can eat grain at will. Or the calves may be kept in roomy box stalls, allowed to suckle their nurse cows twice daily, and turned out at night for exercise. They should be allowed to suckle for at least 5 or 6 months and as much longer as possible.

Later calf feeding is not difficult if one carefully selects the right feeds; but profitable calves are *not* grown on corn and timothy hay. A grain ration of 2 parts cracked corn, 1 part oats, and 1 part bran (or a little oil meal) is very satisfactory. A little molasses diluted with water will sweeten the feed and stimulate the appetite. Feed as much of this mixture as the calves will clean up twice daily.

Calves for show or special sale are sometimes fed 3 times a day. Bright, leafy alfalfa or clover hay fed generously makes the best roughage, but mixed hay will do. A little silage or a few roots add succulence and palatability to the ration. Fresh water and salt should be before the calves at all times.

The best calves are produced under the most practical, ordinary conditions. Enclosed buildings and tight windows are not wanted,

their feet and the grass they get is succulent, healthful, and keeps them on feed.

To save time and trouble later on, all calves should be taught to lead while young. When a few months old fit them with halters and carefully tie them up a short time each day. Then lead them regularly to suckle or to water for a few days. In leading for the first few times pull diagonally that is, first to one side and then to the other, but don't pull or drag a calf forcibly as this is hard on the beast and tends to make him stubborn.

Nothing makes a show calf more attractive than a smooth, well shaped horn, but these sometimes need attention. If they grow too high, weight them down (several satisfactory weights are on the market, or large burrs may be screwed on the ends). Later scrape the horns until they are somewhat flat, smooth and symmetrical, then polish with whiting, sweet oil, and a woolen rag. Clip the heads, tails, and legs below the knee and hock of Angus calves, but only the tails of Shorthorns and Herefords. Leave plenty of brush and don't clip too high at the tail head. Calves standing in the barn will get long and "cradle-shaped" in the feet. Do not trim the feet by simply cutting off the toes; pare down the soles as well until the feet are a natural shape but don't cut too deep.

An occasional washing with soft water and tar soap will keep the coat and skin in good shape. A daily rub with an oiled woolen rag will remove the dust and keep the coat clean. To control lice make a solution of the best dip obtainable and apply thoroughly with a brush to all parts of the calf. This should be done at intervals of 10 days until the pests are gone. The dip will also brighten and liven the hair. Applications of iodine will kill ringworm. Calves that have a tendency to scour should be fed carefully and not too heavily.

Good breeding, good feeding, exercise, regularity, and quietness are all of first importance. This may mean early rising and an occasional late supper for the herdsman, but remember that extra effort pays.

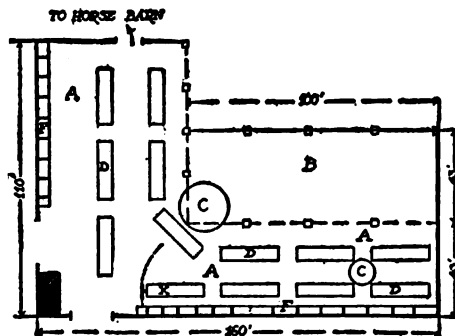


FIG. 63. Plan of a successful feeding shed on an Ohio farm that fattens 150 head of baby beef every year. *a* Cement-floored passage. *b* Covered shed where manure is thrown and covered with straw. *c* Straw stacks. *d* Feeding bunks. *e* Storage bin for acid phosphate to be sprinkled on manure. *f* Hay racks filled from above. *x* Bunk with a wheel so it may be swung around to make room for the feed wagon (Fig 61)

although some shelter is desirable. Heifer and bull calves should be kept in separate box stalls (4 or 5 in each) to make a nicer appearance and to prevent riding. Remember that straw is cheap and that "well bedded is half fed." Manure is more valuable on the land than in the stable—hence keep the stalls clean. Clean, airy, darkened stalls will control flies; screening is not practical and blanketing is usually too warm. Calves that are forced fed must have exercise; turn them out nights in a pasture or paddock. The exercise stimulates the appetite and keeps the calves right on

CHAPTER 7

Dual Purpose Cattle

By the late THOMAS SHAW, whose books and teachings have made him well known to farmers all over the country. For 25 years he owned and ran a 500-acre farm in Canada; for 5 years he was Professor of Agriculture at the Ontario Agricultural College. From 1893 to 1905 he was Professor of Animal Husbandry at the University of Minnesota. Then, after giving some years to editorial work, he became Agricultural Expert of the Northern Pacific and Great Northern railroads. As farmer, teacher, and President of the American Milking Shorthorn Association, he has had unlimited opportunity to study this type of cattle. Like other subjects that take a middle course between two distinct lines of development, the dual purpose animal has been severely criticized by supporters of specialized breeds. Nevertheless it is raised by, and popular with many practical farmers, which warrants its careful and unbiased consideration.—EDITOR.

WHAT they are. Dual purpose cattle are, as the name implies, two purpose cattle that are adapted for the production of both milk and meat in satisfactory proportions. It has never been claimed for them that they will measure up to the straight dairy breeds in milk production, or to the straight beef breeds in beef production, but it is claimed that they will prove more profitable than either under average conditions on the average cultivated farm when their combined products are taken into account. It has never been claimed that they should take the place of the strictly dairy breeds where milk is the all important consideration, or the place of the beef breeds where beef is the only product wanted and expected, as, for instance, on the range. Their place is on the cultivated farm, where the cows can and will be regularly milked and from which the milk, or at least the butterfat, will be sold.

The demand for the dual type of cattle on the arable farm has increased greatly in recent years and is to-day, it seems safe to say, not exceeded and probably not equaled by that for any other group or breed. At one time the opening up of the vast ranges of western America made possible the production of beef so cheaply that it did not pay to grow it on the arable farm. At most the half developed cattle were simply brought in from the range and finished there. The increased demand for dual purpose stock has been helped along, first, by the rise in the price of beef—a rise that promises to continue—and second by the reduction of the area of the range pastures. In 14 states in which cattle used to be grazed in great numbers some 300,000,000 acres are being taken up as dry land farms for the raising of grain. At the same time the population of the country is increasing and as a result we are importing meat to help out our supply! Still the cry for more meat continues. The question is: Where is it to come from? The ranges are being reduced, their supply of feeders is becoming too small to meet the demand. The arable farm remains the only source. But what kind of animals can be raised there to supply the desired meat? Not surplus stock of the pure dairy breeds, certainly.

The choice lies between the straight beef and the dual purpose types with the latter peculiarly fitted to fill the bill, since it means both a moderately profitable supply of milk and a calf to be made into meat each year. For example, the man who keeps straight beef cattle on the arable farm must rear the calves on their dams. A calf thus reared at 12 months will weigh about 800 pounds,

provided it is well fed after weaning, and with beef at $7\frac{1}{2}$ cents will be worth in the stockyards about \$60. The man who keeps a good cow of the dual purpose type will get perhaps 6,000 pounds of 3.9 per cent. milk, which with butter-fat at 30 cents will be worth about \$75. The calf that she produces will be reared on the skimmilk left over and some grain during the milk period, and later on the lower priced farm products. If well fed and cared for it will weigh, say, 700 pounds at 12 months and be worth in the stock yards, say \$50. The returns from the dual purpose cow, therefore, will be \$75 plus \$50 or \$125 against \$60 from the straight beef cow. The cost of milking must of course be considered, and also the added cost of supplementary feed fed to the dual type calf, but there can be no question that the larger profit for the year's work is obtained from the dual cow. At the age of 2 years the calves will be worth about equal money when sold in finished form.

Dual Purpose Cattle in Europe

Dual purpose cattle are much more numerous in Great Britain and other European countries than in the United States and Canada. In Great Britain it is estimated that fully 80 per cent of the milk used is supplied by such animals, which stand as the chief source of revenue with which the small farmer can meet the high land rents found there. The dual purpose breeds in Britain are, the Milking Shorthorn, the Red Lincolnshire, the Red Poll, the South Devon, the Dexter, and a few more of minor importance such as the few remaining Longhorns, the

formation is in a marked degree similar. The males differ chiefly in having a slightly longer head, neck, and barrel than the beef type, and not quite so much blocky massiveness. The females differ mainly in having a longer and somewhat finer head and neck, a longer barrel and hind quarter and a more liberal development of udder and milk veins. The two classes are recorded in the same herd book, but in addition the Dairy Shorthorn Society which is an auxiliary of the Shorthorn Society of Great Britain and Ireland, publishes an annual which records the yearly production

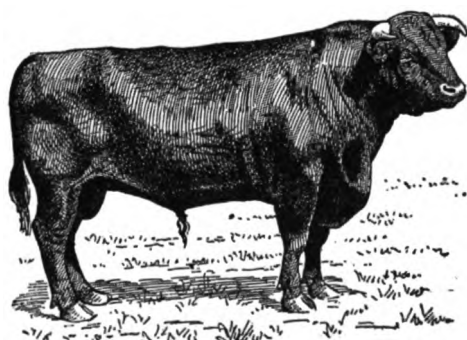


FIG. 64. English bred Milking Shorthorn bull, Bransby's Coming Star, imported by the late J. J. Hill

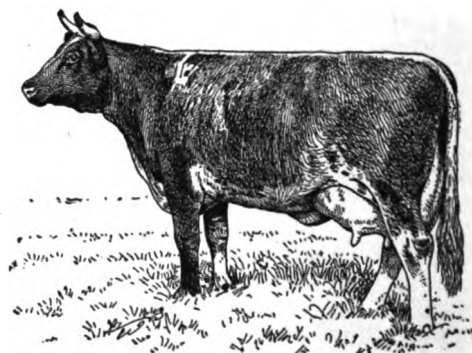


FIG. 65. English bred Milking Shorthorn cow, Pansy 2d, imported by the late J. J. Hill

North Devons that incline more toward beef than to milk production, and the Kerries that incline in the opposite direction.

The Milking Shorthorns, called in Britain Dairy Shorthorns, are not separate and distinct from the Shorthorn breed. They are simply Shorthorn cattle that have been hand milked from generation to generation and bred and selected with an eye to both milk and meat production of a reasonably high order. They have the same color markings as the beef Shorthorns, and the con-

of registered cows belonging to members who may care to enter them. However, the keeping of milk records is not obligatory.

When, in the eighteenth century, the Shorthorn breed was being developed, all animals of the breed were, practically speaking, dual purpose, hence all the early specimens of the breed imported into the United States and Canada were of this class. During the latter part of the eighteenth and much of the nineteenth century several noted breeders centred their efforts on improving

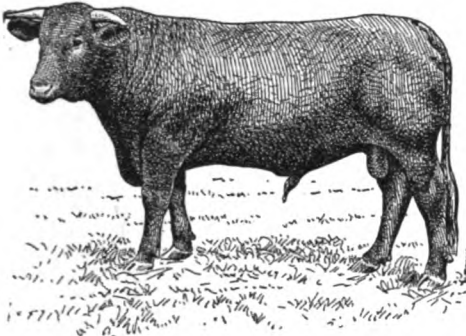


FIG. 66. Imported South Devon bull, Langston King, at two years of age

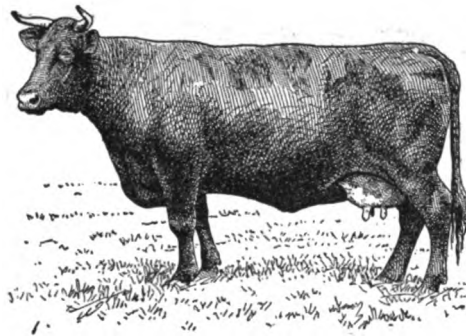


FIG. 67. English bred South Devon cow, Countess. Note the udder development combined with desirable beef conformation.

the beef qualities of Shorthorns, to such an extent as to lessen their milk production. The most famous of these were the Bros. Colling, the Booths, father and sons, and Amos Cruickshank. (The famous breeder, Thomas Bates, who lived at the same time as the Booths, gave much attention to the development of the dual qualities and as a result these show to a marked degree in the descendants of his animals even to the present day). But in spite of these efforts, many breeders continued to breed many pure Shorthorns along dual lines, and nearly all the grade Shorthorns. Hence an overwhelming majority of English Shorthorns are of the dual type when the grades are included, and a very large proportion of the latter are practically pure though not recorded. This explains why, at the London Dairy Show, Shorthorns usually outnumber all the pure dairy breeds combined. It also explains why Britain is now able to export milking Shorthorns in large numbers to the United

States, Canada, Australia, New Zealand, South Africa, and other countries.

The Red Lincolnshire cat are chiefly confined to the county of Lincoln. They are of pure Shorthorn ancestry, a whole red in color and recorded in a separate registry. The *Red Polls* are most numerous in the counties of Norfolk and Suffolk, and are red in color and of less size than the Shorthorns. The *South Devons* are large, light red, and excellent producers of both meat and milk. The *Dexters*, found in both England and Ireland, are small and relatively few.

On the continent of Europe many of the cattle are of the dual purpose class, especially in Belgium, Northern France, and Germany. Even the *Holsteins* in Holland, though essentially dairy cattle, include many animals possessed of what is termed the "milk and meat" form. The two principal breeds of Switzerland, the *Brown Swiss* and the *Simmenthaler*, are distinctly of the dual type.

Dual Purpose Breeds in America

The great majority of dual cattle in the United States and Canada to-day belong to the Shorthorn, Red Poll, and Brown Swiss breeds, with the first mentioned easily the strongest in numbers and importance.

The *Red Polls* now bred in many states are managed along dual lines, but too many of the breeders are following the practice of rearing the calves on their dams, a practice that is disastrous to prolonged and high milk production. The American Red Polled Cattle Club has, however, established an Advanced Registry for milk production records and also offers prizes for the highest average milk production, which beyond question will tend to produce higher standards in competing herds.

Some years ago the Brown Swiss Breeders' Association passed resolutions to the effect that the breed should be classed as one of special purpose dairy type, and, according to its Secretary, has been continually breeding them for the dairy, "although it is a fact that the Brown Swiss are a good beef cattle." The conformation of the Brown Swiss is unquestionably of the dual type, and the general run of breeders of that class of cattle in America to-day would like to have them

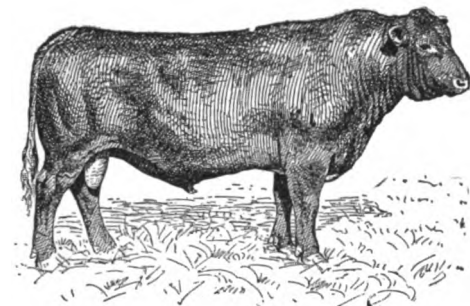


FIG. 68. Red Polled bull, Teddy's Best, 17 times a grand champion and sire or grandsire of most of the modern prize winners in America.

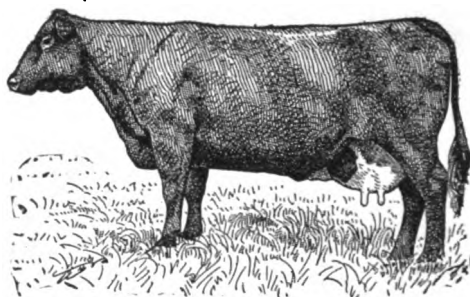


FIG. 69. Red Polled cow, Jean Du Luth Beauty, holder of the world's record for the breed of 891 pounds of butter fat in a year.

thus classified, now that a decided demand is sweeping over the country for cattle of the dual type. (See Chapter 8 for description of the Brown Swiss.)

The only importation of *South Devon* cattle ever brought to the United States was made by the late Mr. J. J. Hill in 1914, when he imported a male and 10 females. The male, Langston King, weighed 2,400 pounds at 30 months. The *Dexter* breed is represented in America by less than a dozen herds and the *Red Lincolnshires*, strange to say, have never been imported.

The Milking Shorthorns. The number of purebreds of this type cannot be given since the American Shorthorn Breeders' Association does not make compulsory the keeping of milk records. Without doubt the beef type is represented by a very great majority of the whole number. This unfortunate condition has been brought about by the extensive use of Scotch bulls during the last 40 years and the practice, almost universally followed, of rearing the calves on their dams. There is good reason to believe that the number of *grade* milking Shorthorns in the United States is large. This can be accounted for by the fact that farmers who kept grade Shorthorns on arable farms generally milked them and so retained their producing qualities.

With a view toward stimulating the breeding and distribution of cattle of the now widely desired dual type, the American Milking Shorthorn Breeders' Association was organized on September 8, 1914, at St. Paul, Minnesota. The following were chief among the objects sought in establishing it: (1) To encourage the breeding in America of Shorthorns that measure up to a high standard in the production of both meat and milk; (2) To keep a record of the same to be published from time to time in herd book form; (3) To collect and distribute information regarding the performance of the animals recorded, at the pail and on the block; (4) to furnish assurance in the form of registration that the animals recorded are possessed of the dual quality.

During recent years some of the breeders of beef Shorthorns have been selling males of inferior form to farmers who were seeking Shorthorn sires of good milking ancestry, claiming the lack of good beef form to be an evidence of the inheritance of good milking qualities. They thus took advantage of the credulity of those who did not know, to sell males from an ancestry that had not been hand-milked for many generations. Good milking cattle can never be produced on such lines. One of the principal objects sought by the organization was to head off such dishonesty, which was working great harm to the cause of the milking Shorthorn. The new organization accepts any animal for registration that is already recorded in either the English, the American, or the Canadian Shorthorn Association, providing it measures up to the standard called for in production and weight. The annual production of milk called for in a mature cow is 6,000

pounds, and the minimum weight 1,250 pounds. Provision is also made for recording grades that can show 4 consecutive crosses of Shorthorn blood from recorded sires, providing they measure up to the standards of weight and milk production, and are possessed of correct Shorthorn conformation and color. This is the only cattle breeders' association in America that thus encourages the farmer to so improve his stock by upgrading that they may finally be recorded as pure.

What Milking Shorthorns Can Do

The ability of Milking Shorthorns in both England and America to produce milk abundantly is shown by more records than there is space here to include. For instance, the herd of Robert W. Hobbs and Sons, Kelm-scott, Lechlade, Gloucestershire, England,

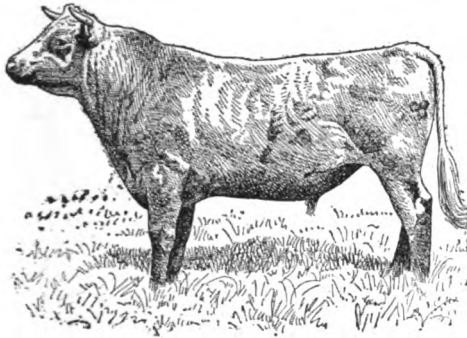


FIG. 70. American bred Milking Shorthorn bull, Waterloo Clay, whose quality, type, and promise have been borne out by the performances of his offspring.

averages nearly 200 cows and heifers in milk. For several years past the average year's production of the entire herd has been more than 6,000 pounds per cow, testing nearly 4 per cent of fat, several cows having made better than 10,000 pounds. At the Cranford sale of the stock of the late George Taylor held in 1911, 32 cows were sold that had to their credit over 10,000 pounds a year each. The Red Lincolnshire herd of John Evans, Burton, near the city of Lincoln, it may be mentioned, has averaged something over 40 cows and heifers for the past 24 years, with an average production during that time of fully 8,000 pounds a year. Many grade Shorthorn herds have averaged from 7,000 to 8,000 pounds of milk a year for successive years. As instances of records that were not only high but also long continued may be cited those of the cow, Darlington Cranford 5th, bought from the late George Taylor for the Tring Park herd of Lord Rothschild, which gave over 10,000 pounds of milk per year for 10 successive years; and the cow Dorothy of the same herd which averaged 10,353.3 pounds for 10 successive years, ending with 1913. Both were producers of excellent offspring.

In the United States, production records of milking Shorthorns are not so numerous as in Britain, but from a large number that might be submitted there is space only for the following: In the Glenside herd owned by L. D. May at Granville Centre, Pa., there were recently 71 cows that prior to 1913 had produced more than 8,000 pounds of milk annually and 23 that had produced more than 10,000 pounds. The cow Rose of Glenside gave in 1909 18,075 pounds of milk containing 625 pounds of butter fat. In the herd of W. C. Davis of Chester, Iowa, are 4 cows that have produced an average of 10,876 pounds in a year, and six that have produced an average of 8,526.9 pounds. In 1917 the official world's record for the breed was held by L. D. May's Doris Clay, with a year's production of 17,241.5 pounds of milk, 653.35 pounds of fat.

It should be stated, however, that the American Milking Shorthorn Breeders' As-



FIG. 71. American bred Milking Shorthorn cow, Cressida, showing the type desired by American breeders

sociation does not lend encouragement to the making of phenomenal or forced records, but aims rather, first, to compel the keeping of records as the basis of registration, second to encourage the average farmer to bring up the annual milk production of each cow, to from 6,000 to 8,000 pounds, and third, to get all the beef attainable after this has been done.

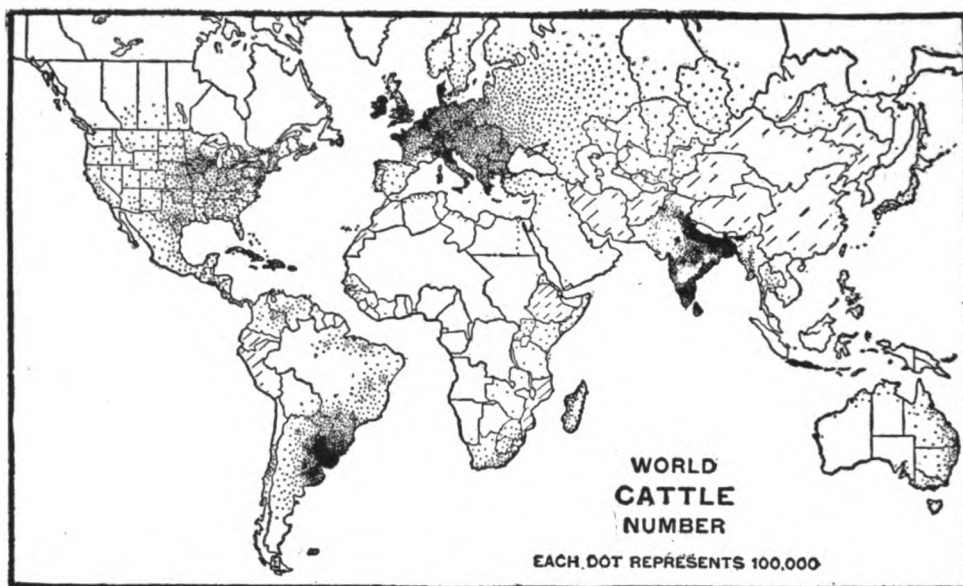


FIG. 72. How cattle are distributed over the world (1916 Yearbook, U. S. Dept. of Agr.). See page 88

CHAPTER 8

Types and Breeds of Cattle—United States Cattle Industry Statistics

Based on standard modern texts—especially Plumb's "Types and Breeds of Farm Animals"—the opinions of acknowledged authorities, and statistics supplied by the offices of the various breed organizations in the United States.—EDITOR.

CATTLE, like horses, have been used and cared for by man since the very earliest times. Their value as a source of meat and of milk and its products was appreciated even before civilization had progressed beyond what historians call the *nomadic stage*—that is the period of human development when men knew nothing about tilling the soil and raising crops, had no permanent homes, and lived in a wandering, hand-to-mouth manner with the help of the flocks and herds they drove with them. However, the real importance and development of cattle did not begin until man entered upon his second or *agricultural stage*, when their adaptability to varied conditions and their ready response to care, good feeding, etc., became apparent. Of course, the cattle of those ancient times were far different from what have been called the "most important domestic animals of English speaking peoples" to-day, but they were the foundation upon which the marvellous milk- and meat-making machines of to-day have been made.

In addition to supplying meat and milk, cattle are an important source of leather; also they are in some places still employed as heavy draft animals, though far less than formerly. Many herds, maintained solely or principally for breeding purposes and the production of high grade stock, represent huge investments and

considerable profits. Finally, in providing manure with which to maintain or build up the fertility of farm soils, cattle play a tremendously important part in agriculture for which they do not always receive credit. For this last reason alone it is doubtful whether intensive farming could be successfully and profitably carried on in many sections but for the presence there of cattle.

Any discussion of types and breeds must naturally be based on purebred, highly improved animals, even though these are undoubtedly far outnumbered by the grades and scrubs kept on average farms. These superior specimens represent what the breeds should be, and stand as ideals toward which every farmer, no matter how small or inferior his herd, should keep his face turned and his efforts directed. The sentiment of modern farmers is constantly becoming stronger in favor of the purebred sire and grade cows, each generation of which is better than the last. The "dark ages" in which the scrub and the "boarder" were put up with, either because the farmer couldn't recognize them or because he thought they were "good enough," are passing into history. By studying the special characteristics, adaptations, and possibilities of the different breeds, and selecting and breeding only individuals that exhibit desirable qualities, every farmer can help to make the day of the unprofitable cow only a memory.

This chapter covers the breeds included in the specialized beef and dairy types of cattle as they are represented in the farming activities of the United States. Dual purpose breeds are treated in Chapter 7.

The Beef Type

What it is. Beef cattle have been selected, bred, and developed to produce meat; weight, quality, correct formation, and early maturity are essential factors.

In general, *weight* is most important since it directly represents the amount of meat in the carcass. The range in beef cattle is from 1,200 pounds for cows to 2,200 or rarely 3,000 pounds for aged bulls. *Quality* is indicated by size, fineness and texture of bone, small fine joints, and a loose, pliable, mellow skin of medium thickness carrying a coat of silky hair. Quality is especially important because it indicates the percentage of waste (and the corresponding money loss) to be expected at the block. Satisfactory weight and desirable quality combined practically determine the market value of an animal.

AVERAGE WEIGHTS OF BEEF BREEDS AT DIFFERENT AGES

(COMPILED BY WM. HYSLOP, ANIMAL HUSBANDMAN, WASHINGTON EXPERIMENT STATION)

BREED	SEX	1 YEAR	2 YEARS	3 YEARS	4 YEARS AND OVER
Aberdeen Angus.. {	Bull	850 lbs.	1,225 lbs.	1,625 lbs.	1,950 lbs.
	Cow	700 "	1,180 "	1,525 "	1,625 "
Galloway..... {	Bull	800 "	1,175 "	1,525 "	1,800 "
	Cow	675 "	1,050 "	1,350 "	1,500 "
Hereford..... {	Bull	900 "	1,350 "	1,700 "	2,000 "
	Cow	800 "	1,275 "	1,625 "	1,700 "
Shorthorn..... {	Bull	925 "	1,400 "	1,725 "	2,000 "
	Cow	825 "	1,300 "	1,625 "	1,725 "

Ideal *conformation* in the beef type includes length, width, and depth set low on short legs, and a squareness and compactness of body. From the feeder's standpoint "blocky" animals fatten more easily, dress out better, carry a higher percentage of high priced cuts and are therefore much more desirable than "rangy, leggy" ones. The head should be short and broad, and the muzzle wide, indicating feeding capacity; the neck short and thick; the shoulder smooth, level, extended well back and well covered with firm flesh; the chest large, broad, and deep at the heart girth showing constitution, stamina, and vitality. A marked spring of rib is always associated with a desirable wide strong back. A wide and deep loin and long, level, and smooth hind quarters, when well covered with meat of the right quality insure a high percentage of the most valuable cuts. Poorly covered hooks or pin bones and a rough tail head are objectionable. The hind quarters should be long and broad with squareness carried well down showing depth of twist, and a low, straight flank. Desirable *temperament* and profitable feeding qualities are indicated by quiet eyes set well apart in a short, broad "dished" face; restless eyes and a long, narrow face and muzzle are certain indications of a poor and unprofitable feeder. *Early maturity*, especially in view of the modern demand for "baby beef," is all important. Under this head are combined rapid growth and development, economical use of feed, and the production of well mottled but not overfat meat of fine quality. To show early maturing qualities a "finished" steer should weigh from 1,600 to 1,800 pounds at 2 years of age; "baby beeves" may range from 12 to 18 months old and should make 800 to 1,000 pounds or more by this age.

The Beef Breeds

Aberdeen Angus. This breed, developed in Scotland, is very compact and low set. The color is almost without exception solid black; white markings and solid red occur very rarely. The head is hornless (polled), broad, and short; the neck is short and smoothly attached to the broad and well covered shoulder; the body is broad and deep, but tends to roundness rather than squareness as in the Shorthorn and Hereford; the loin is also rounded and neither so deep nor so wide as in those breeds. The hind quarters lack the Shorthorn squareness both across the top of the tail head and at the back of the thigh, but in smooth covering of flesh, admirable in amount and quality, they rank with any. The elastic mellow skin, fine glossy hair, and small refined bone are proof of superior quality. In weight the Angus is deceptive because of its low, blocky, and apparently small body. The quality of its meat is excellent, and carcasses often dress as high as 56 per cent. This, combined with early maturity and economical utilization of feed, has made the Angus a leader in feed-lot popularity in the United States.

American Aberdeen Angus Breeders' Association, 817 Exchange Ave., Chicago, Ill.

Galloway. This breed, like the Angus, is native to Scotland, black in color and polled, but its hair is long, thick, and curly; the head is less peaked in the poll, and the ears are set farther back. In color, too, a slightly greater range is permissible, reddish or brownish not being objectionable.

The breed has been criticized for lack of spring of rib, high tail head, and comparatively slow maturity. Of recent years, however, these defects have been largely overcome by careful breeding so that although the Galloway does not mature as early as the Angus, Shorthorn, or Hereford, and is less numerous, it compares favorably with any of them.

United States records from 1913 to 1916 show a total registry of 4,882 animals distributed over 33 states, Kansas having 1,981; Missouri, 730; South Dakota, 474; Nebraska, 477; and Iowa, 315. Record prices for Galloways in this country are \$2,150 for a bull and \$1,200 for a cow; however, there are but few herds bred mainly for show purposes, breeders finding the steady demands from the Western ranges more attractive than the opportunity to enter their animals in fat stock shows. Moreover, Galloway breeders are mostly practical farmers who give more attention to the utility features of their cattle than to show-ring standards, feeding their steers over periods of 12 months or more, and seldom entering them in the short fed classes.

American Galloway Breeders' Association, Carrollton, Mo.

Hereford. This breed, developed in southwest England, is easily recognized by its red body, white face, white brush, and often white underline and ridge or topline; the horns, especially of the bull, are white or yellowish-white and curve slightly forward and downward. It is rounded or cylindrical in body and very short legged and blocky, in these respects resembling the Angus, though in

NAME	ORIGIN	PURPOSE	AVERAGE WEIGHT POUNDS		COLOR	SPECIAL CHARACTERISTICS
			BULL	COW		
Aberdeen Angus	Scotland	Beef	2100	1550	Black(usually)	Polled head; heavy, compact rounded body; short legs; flesh laid on smoothly
Ayrshire	S. W. Scotland	Dairy	1500	1000	Red and white	Head carried high; large, upcurving horns; large well shaped udder; good sized, well placed teats. Hardy, a good grazer
Brown Swiss	Switzerland	Dairy	1800	1350	Brown or gray; calves pearl gray	Short, broad head; heavy, short neck; muscular shoulder; straight, strong back. Hindquarters somewhat beefy
Devon	England	Dual Purpose	1800	1400	Solid bright red	Color; refined, well carried head; long, white, black-tipped horns; small, refined bone
Dutch Belted (Lakenfeld)	Holland	Dairy	1500	1000	Black, with broad white band around body	Color and marking always inherited
French Canadian	S. E. Canada	Dairy	1000	850	Black to brindle or fawn	Hardiness. A good grazer and easy keeper
Galloway	Scotland	Beef	1850	1425	Black (dark brown)	Polled head; long, shaggy, curly hair. Very hardy
Guernsey	Island of Guernsey	Dairy	1500	1000	Light red to reddish fawn and white	High color of milk and skin secretions; light ring around eye
Hereford	England	Beef	2200	1700	Red with white face or head, brush, underline and ridge	Color and marking always inherited; long, forward curving horns
Holstein-Friesian	Holland	Dairy	1950	1250	Black and white	Size; great milk producing ability; color
Jersey	Island of Jersey	Dairy	1300	900	Light fawn or brown and mouse color	Refinement; quality; rich milk; absence of white markings; black muzzle and tongue
Kerry and Dexter	Ireland	Dairy	900	550	Black	Very small size. Hardy, good grazers, easy keepers
Milking Shorthorn	England	Dual Purpose	2300	1800	Roan, red, white, mixed	Combination of beef type and milking qualities
Polled Durham	United States	Beef	2300	1800	Roan, red, white, mixed	Polled head. Otherwise a Shorthorn
Red Polled	England	Dual Purpose	2000	1250	Light or dark red	Polled head. Excellent dual purpose type
Shorthorn	N. E. England	Beef	2300	1800	Roan, red, white, mixed	Roan color; short, heavy horns; excellent beef development of hindquarters; popularity wide
Sussex	England	Beef	2000	1400	Solid dark red	Large, incurving horns. Little known in the United States
Longhorn or Texas Steer	Southwestern U. S.	Beef	1200	750	Various shades of red, brown and yellow are commonest colors	Long, wide spreading horns, long legs; spare body; poor beef type
West Highland	Scotland	Beef	1200	900	Light to dark red	Large, long horns; curly, shaggy coat; wild nature and expression

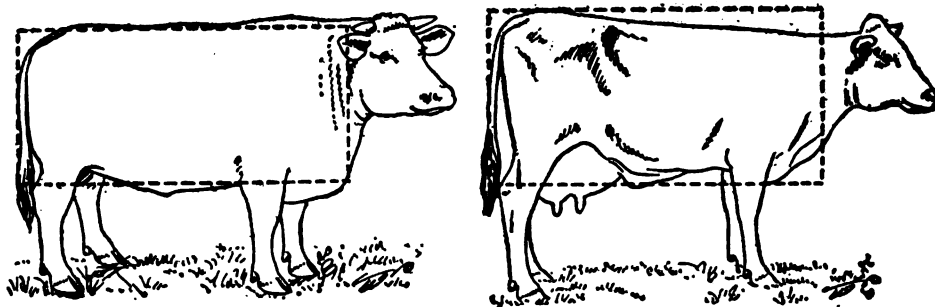


FIG. 73. How typical beef and dairy cattle differ in shape of body as viewed from the side

general it ranges larger and heavier. In the United States the Hereford has proved of tremendous importance in grading up Western range stock. It is especially well adapted for such work because of its hardiness and unsurpassed foraging ability. Moreover it is noted for early maturity, which especially fits it for the production of "baby" beef.

The most common criticisms of the Hereford have been directed at its throatiness, heavy dewlap and somewhat light hind quarters, but these defects are much less noticeable than formerly.

Hereford cattle are found in every state in the Union, but are most numerous in Texas, Iowa, Missouri, and Kansas. On January 1, 1917, 602,787 animals had been recorded. The record price for a Hereford bull was \$15,100 paid for Woodford 6th at the International sale in Chicago in December, 1916. During 1916 there were 93 public sales of registered Herefords in the United States in which 5,983 separate lots were sold for an aggregate of \$2,120,026, or an average of \$355 per lot, a lot consisting of either a single animal or a cow with calf at foot.

American Hereford Cattle Breeders' Association, Kansas City, Mo.

American Polled Hereford Breeders' Association, Des Moines, Ia.

Polled Durham. Aside from the polled character which was developed in the United States, practically all Polled Durhams of today are pure Shorthorns, tracing back in unbroken ancestry to England. Individuals possessing this pure Shorthorn blood are known as "double standard," and are eligible to registry in both the *American Shorthorn Herdbook* and the *Polled Durham Herdbook*. Individuals not having pure Shorthorn blood, such as those derived from crossing Shorthorn bulls on native "muley" or hornless cows, are "single standard" or eligible to registry only in the *Polled Durham Herdbook*. Polled Durhams are increasing in both numbers and popularity, good animals being equal in all respects to Shorthorns.

Polled Durham Breeders' Association, Greenville, O.

American Shorthorn Breeders' Association, Chicago, Ill.

Shorthorn. This breed, developed in north-west England from stock of unknown origin, has, because of its merit as a beef producer, been distributed throughout the world and become generally popular; it leads all beef breeds in the United States. The Shorthorn adheres closely to the true beef type, is low, broad, blocky, and probably our heaviest beef breed. In color it ranges from dark or light red to pure white, but roan—a mingling of red and white hairs found in no other breed—is the commonest and most popular color. Black should not occur and disqualifies purebred Shorthorns for registry. Other notable characteristics are the comparatively short horns curving slightly forward and downward; the square, compact and evenly fleshed body; the long, broad, deep, and very desirable hind quarters; and the milking qualities of the breed as a whole. No other beef breed equals it in ability to raise its calves.

The Shorthorn has been somewhat criticized because it shows a tendency to become "patchy" due to the formation of rolls of fat under the skin, especially on the rump, when kept for long periods in extreme show-ring condition. Too great length of leg has also been mentioned, but this criticism can seldom be applied to the best animals, especially those of Scotch blood. For economy and early maturity in the feed lot it is excelled by no other breed, but for range conditions it is not equal to the Hereford or the Galloway.

In 1916 the record sale price for a Shorthorn bull was \$6,600 paid for Maxwalton Pride 2nd; for a cow, \$3,050 for Gypsy Maid. A carload of Shorthorns, dressing 67½ per cent., won the carload lot contest at the International Live Stock Exposition over all breeds. At present there are approximately 490,000 purebred bulls and 730,000 cows registered in the American Shorthorn Herd Book; in the distribution of more than 20,000 breeders in 46 states Iowa leads with 4,070 breeders, Illinois is second with 1,855 and Nebraska third with 1,840.

American Shorthorn Breeders' Association, Chicago, Ill.

Sussex. An English breed, characterized by its solid, deep red color and never extensively imported to, or popular in, the United States. In general it conforms to the standards set for the beef breeds, but lacks somewhat in quality and tends to be coarse in hind quarters, neck, and shoulder development. In size it is equal to the Hereford but does not mature so early and is not so well adapted to grazing on the open range.

American Sussex Cattle Association, Nashville, Tenn.

Texas Longhorn or "Texas steer." Not really a breed but rather a distinct type, characterized by its huge spreading horns often exceeding 6 feet in length from tip to tip. It was formerly found in great numbers in southwestern United States where it represented the original range cattle, supposed to have been descended from stock introduced into Mexico by the early Spanish explorers. For many years it was an important factor both in range management and in the nation's beef supply, but being inferior in size, quality, conformation, and feeding ability to any of the improved beef breeds, it has gradually been graded up and out of existence by the use of

better blood. Few if any of the original type remain and it has lost all but its historical importance.

West Highland. Native to the Highlands of western Scotland, and thought to be descended from the ancient native cattle of the British Isles, this breed has never been extensively imported though its hardiness and grazing qualities are highly developed. It is small, seldom greatly exceeding 1,200 pounds; it is low, square, and broad of form; and when fattened it produces meat of the best quality. Colors range from yellow-red to black, red, and red-black being most common. The hair is very long and shaggy, often reaching a length of 6 inches on the head and neck. The horns are long, massive, and gracefully curved; these, with the well carried head, fearless eye, and graceful and slow movement, denote an animal free, independent, untamed. West Highland blood doubtless played a considerable part in the development of more recently established Scotch breeds; at present the cattle are raised more for ornamental purposes by owners of large estates in Scotland and England than for beef production. Commercial herds are kept in a few regions too rough and hilly for other breeds, later fattened in the Lowlands, and finally shipped to London where they find a steady demand at top prices.

The Dairy Type

What it is. The dairy type is the result of long, careful breeding and selection with the development and fixing of one character—namely great milk production—as the all-important aim. Every female of that group of animals called mammals (those that suckle their young) produces some milk; but in its natural condition this is only enough to rear its offspring to weaning age. This was the case with all cattle when they were wild or half wild creatures; the modern cow, thanks to man's skill and efforts as a breeder, is practically a "milk machine," yielding a much greater daily supply for 10 or more months at a time, and giving in a year 5, 10, or in some instances 20 times her own weight in a year!

The ideal dairy type is almost the direct opposite of the beef type; "spare-

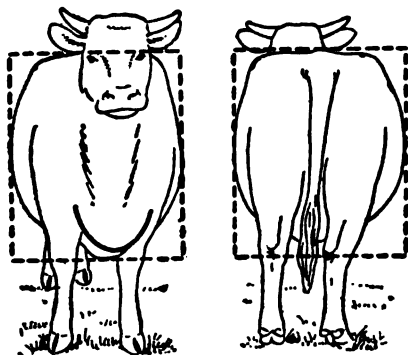


FIG. 74. The beef type is smooth, massive, and nearly fills a square when seen from front or rear

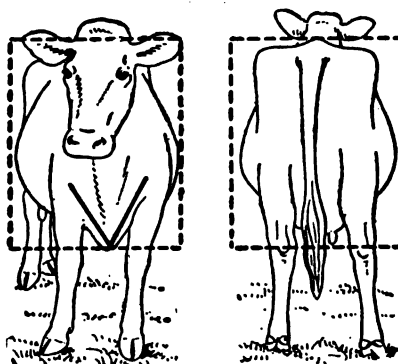


FIG. 75. The dairy type is spare, angular, and fills only a part of a square of similar proportions

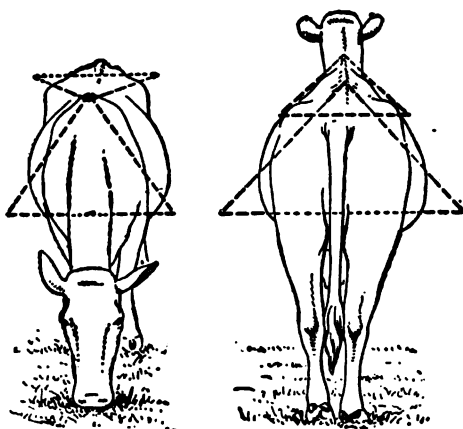


FIG. 76. The dairy type is wedge-shaped viewed from the top and also from front or rear

ness" of form takes the place of squareness and "beefiness;" angularity of outline, prominent bones and joints and an entire absence of surplus fat replace the blockiness and thick, smooth covering of fat and flesh that mark the beef carcass. The dairy breeds vary widely in *weight* and size, and the difference in weight between cows and bulls is greater than in the beef breeds. A fair average for cows is from 800 to 1,250 pounds; for bulls from 1,600 to 1,950, though weights of 2,700 and over have been recorded. In all cases weight should represent size of frame and bone, not excess fat. In *conformation* the dairy breeds are roughly *wedge-shaped* when viewed from each of three viewpoints: (1) As viewed from the front—the cow should be narrow at top of shoulder widening through the heartgirth at the level of the elbows; (2) As viewed from above, the topline should be narrow at the shoulder, widening through the barrel and widest through the hind quarters; (3) As viewed from the side—the depth should increase from front to rear, being greatest where an up and down line would cut directly across the udder. Good heartgirth and width of chest indicate constitution and vitality. Large barrel and good spring of well spaced ribs indicate ability to consume large quantities of feed and convert it into milk. The udder should be large, soft, and symmetrical, attached well up behind and carried well forward. The teats, which vary somewhat among different breeds, should be medium sized. Milk veins should be numerous, large, and winding and should enter the abdominal wall well forward through large openings or "milk wells." The importance of milk veins is based upon the circulation of blood through the udder, and is by many considered as the best index to milk production. *Quality* is denoted by a loose, mellow, pliable, and moderately thin skin of a yellow color; short glossy hair; leanness or sparseness of form and refinement of bone; and presence of yellowish, oily secretions especially inside the ears, in the brush at end of tail and about the udder. *Dairy temperament* is indicated by large, mild, quiet eyes; dished face and moderately wide muzzle; thin neck and narrow withers; and general sparseness and capacity.

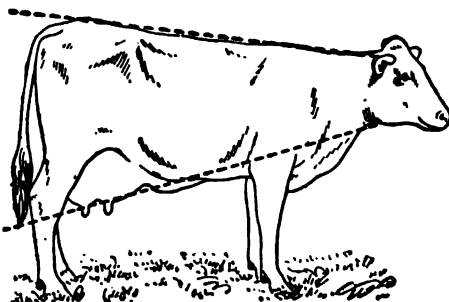


FIG. 77. Showing the third or side view of a dairy cow in which the wedge shape is clearly seen

The Dairy Breeds

Ayrshire. A Scotch breed noted for its hardiness, foraging ability, and economical keeping qualities. In color it is red and white; although the shade varies, a medium or bright red as distinguished from brown is preferred. In animals mostly white, the red occurs mainly on head and neck. The striking Ayrshire characteristics are the graceful, upcurving

horns, the almost perfect udder carried far out in front and attached high behind, the very level top line and the smooth tail head. Ayrshires conform closely to the dairy type except in carrying rather more flesh than other breeds. This, however, is a natural breed characteristic and does not indicate beefiness or poor dairy temperament or qualities.

Ayrshire milk ranges in richness between that of average Holsteins and average Jerseys,

or Guernseys, but its fat globules are so small that the cream rises slowly; it therefore is more popular as whole milk or for cheese making than for skimming and butter making. This uniform fat character, making it highly digestible, combined with a pleasant, full flavor, has given it wide popularity and has increased interest in the breed in America.

Up to May 1, 1919, the Ayrshire Register had recorded 22,746 bulls and 56,733 cows, their breeders being distributed over at least 40 states. The record price for a purebred bull up to that date was \$18,000, which was paid for Rosebud's Pride. The highest price on record for a purebred Ayrshire cow was \$8,100, paid for Lotus Jean Armour. The next highest was \$4,200 for Pansy's Daughter of South Farm, and the next, \$4,000 brought by Jean Armour once world's champion and first cow of the breed to produce 20,000 pounds of milk in a year.

Ayrshire Breeders' Association, Brandon, Vt.

Brown Swiss. A brown or mouse gray breed of medium to large size native to eastern Switzerland. Originally considered as of the dual purpose type, it is now being bred in the United States purely for dairy purposes. In general it conforms to the requirements set for dairy breeds; the apparent beefiness of shoulders and hind quarters is the result of muscular development acquired in its mountainous home country and passed from generation to generation. Outstanding qualities of the Brown Swiss are docile nature, long life, hardiness, and good grazing ability.

It is especially adapted to supply a demand for whole milk and milk for cheese production. In the United States, where 6,014 bulls and 8,620 cows of the breed have been registered, the record production for one year is 19,460.6 pounds of milk and 798.16 pounds of butter fat made by the cow College Bravura 2nd 2,577.

The Brown Swiss Cattle Breeders' Association, Beloit, Wis.

Dutch Belted or Lakenfeld. This breed which originated in Holland is easily recognized by a broad white belt extending from shoulder to hip, encircling an otherwise black body. In size it about equals the Ayrshire; in all other respects except milk production it closely resembles the Holstein-Friesian. It is of little or no importance in this country ex-

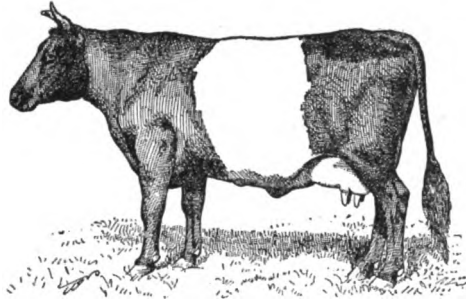


FIG. 79. A Dutch Belted cow

cept from a fancier's standpoint; no importations have been made in more than 50 years.

Dutch Belted Cattle Association of America, Covert, Mich.

French-Canadian. This breed was developed in eastern Canada from stock brought from Brittany and Normandy by the early French settlers. The common colors are black, brindle, and dark brown with black points. Next to the Irish Kerry this is the smallest dairy breed, and like the Kerry is extremely hardy. Canadian breeders claim that it shows high resistance to tuberculosis and that it produces large quantities of milk on very rough and sparse pasture. Though little known outside of Quebec, the French-Canadian is of considerable promise as a dairy breed for like climatic and soil conditions.

French-Canadian Cattle Breeders' Association, Milford, N. Y.

Guernsey. This breed and the Jersey (p. 82) are often called the "Channel breeds" since they originated and have been developed on two small islands of the same names located in the English Channel off the coast of France. (At one time the name Alderney was given rather loosely to animals of either breed). In both places careful selection with definite ends in view and rigid exclusion of all other breeds have resulted in firmly fixed, highly specialized, and efficient (though somewhat different) types along strictly dairy lines.

In color the Guernsey is reddish fawn or tan and white (rarely solid) with rings of light colored hair around the eyes and muzzle. It is of medium size, a little larger, heavier and coarser than the Jersey, is said to be a slightly better grazer and gives on the average a larger milk yield. The milk is more highly colored than that of any other breed and is therefore especially popular for butter making; the skin secretions are also characteristically yellow and abundant. As might be expected from its larger size, quieter disposition, and slightly greater coarseness, the Guernsey matures rather more slowly than the Jersey. However, it is an economical producer and very popular; the demand for good animals far exceeds the supply and high class grades commonly bring \$100 to \$125.

The Guernsey was the last of the important

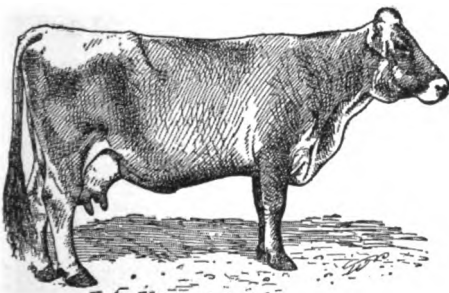


FIG. 78. A good type of Brown Swiss cow

breeds to establish a purebred register in the United States, but in May, 1919, its herdbook listed 56,246 bulls and 91,779 cows. Moreover it was the first breed to establish an Advanced Register. Between 1901, when this was done, and May, 1919, there were 6,971 cows entered and 8,141 yearly tests recorded. Although 8,138 of these were made by 2 year old heifers with first calves, the whole number averages 9,027 pounds of milk 450.82 pounds of fat. Five cows have completed 5 records apiece, 23 have made 4 apiece and some 117 have 3 records to their credit. The 10 leading cows of the breed average more than 19,800 pounds of milk 997 pounds of fat, while the breed record, held by Murne Cowan 19597, is 24,008 pounds of milk, 1,098.8 pounds of fat. Record sales prices are \$25,000 for a bull, Florham Leader 55682, and \$12,500 for a cow, Follyland Nancy 52457.

American Guernsey Cattle Club, Peterboro, N. H.

Holstein-Friesian. This, the largest of the

sometimes said to be safer for infant and invalid feeding. The large yields render the breed especially popular where whole milk is sold in bulk either to the consumer or cheese factory; in the case of high class herds, they offset the low fat content even when butter making is involved.

Developed in a low, flat country of rich grasses and intensive farming, where stall feeding is widely practised, the Holstein has become more docile than other more commonly pastured breeds; it is not a good "rustler," but requires large amounts of bulky but nutritious forage. Its size and muscular development often suggest beefiness, but its remarkable productivity, capacity for food and popularity in dairy sections show this criticism to be unwarranted in general.

The breed is widely distributed, but recognized Holstein "centres" are found in Central New York and Wisconsin. Record prices paid for bulls are \$125,000 for Rag Apple the Great; \$106,000 for Carnation King Sylvia

PERIOD	POUNDS MILK	POUNDS BUTTER FAT	AGE YRS. MO.	NAME AND NUMBER OF COW
7 day	730.8	40.546	8—2	Segis Fayne Johanna 114658
30 "	3,216.6	148.295	6—6	Fairview Korndyke Mata 169926
60 "	6,231.7	288.260	4—11	Ormsby Jane Segis Aaggie 150948
90 "	7,570.0	409.224	6—8	Hester Aaltje Korndyke 133222
1 year	27,761.7	1,205.09	5—0	Duchess Skylark Ormsby 124514
*1 "	33,425.8	1,058.42	9—8	Tilly Alcartra 123459

* This is the world's record for milk

dairy breeds, and from a commercial milk producer's standpoint the most popular in the United States, originated in the provinces of Friesland and Drenthe in Holland, where it has long been bred along definite dairy lines, practically in its present form. Its distinctive black and white are mixed in varying proportions but never blended. Colors of markings that bar even pedigreed cattle from registry are: Solid black; solid white; black switch; solid black, with white on belly only; black on legs beginning at feet and extending to knees and hocks; black with white interspersed on legs, beginning at feet and extending to knees; gray or mixed black and white, generally prevailing; patches of colors other than black or white; red and white.

In production the Holstein leads the dairy breeds, holding world's records as shown in the table. This is the only breed to give official recognition and importance to short term records; that is, 1 day, 7 day, 30 day, etc. The average year's production for 4,250 animals is 14,740 pounds of milk containing 504.63 pounds of fat. The milk contains less fat on the average than that of the Channel breeds, and for this reason is

when only 6 months old; \$65,000 for Sir Pieterjtje Ormsby Mercedes 41st and \$60,000 for Rag Apple 8th (for a half interest in whom \$50,000 was subsequently paid). The record figures for cows are \$40,000 for Segis Hengerveld Fayne Johanna; \$35,000 for Fairview Korndyke Mata; \$26,000 for Rolo Mercena De Kol and \$22,500 for Golf Sietske 10th. Purebreds sold at public sales in 1918 averaged \$256.47 apiece. Up to May 1, 1919, there were registered 265,901 bulls and 494,362 cows. There are about 14,000 members in the breed organization which is the largest body of its kind in this country.

Holstein-Friesian Association of America, Brattleboro, Vt.

Jersey. This popular and beautiful breed originated on the Island of Jersey in the English Channel, where far-sighted breeding methods and strict quarantine regulations have brought it to, and maintained it at, a wonderful degree of excellence and purity. It has been distributed practically throughout the world, never failing to win approval as an economical producer of milk very rich in butter fat. It has always been a favorite of wealthy breeders who, in the United States,

have heavily invested time, money, and effort in importing, testing, breeding and showing animals and promoting the breed's interests generally. In May, 1917, there were some 81,000 Jersey breeders in this country.

Excellent in quality, conformation, ability to make good use of its feed, and in what is called "dairy temperament," the Jersey cow represents the ideal dairy type. At times it has been criticized for excessive refinement, but the modern American type shows a marked tendency toward increased constitutional vigor, robust nature, and hardiness. Early maturity (making possible early breeding) clean cut lines, fine bone and soft, fine skin are outstanding features.

In color Jerseys range from almost black (mulberry black) to a very light fawn; dark fawn shading to a lighter tone along the back bone and on the lower limbs is especially popular from the standpoint of the breeder whose interests are largely in the showing.

The Jersey is probably best known for the richness of its milk. This makes possible excellent fat and butter records, even though the best Jersey milk record of 19,694.8 pounds made by Passport 219,742, is less than the best performances of the other leading dairy breeds. The butter fat record for the breed is 1,031 pounds of fat from 14,925 pounds of milk made by Vive la France 319,616. The average yearly production for 11,290 Register of Merit tests is 7,910 pounds of milk, 425 pounds of fat, the average fat percentage being 5.37—higher than that of any other breed.

Record prices for Jersey bulls are \$30,000 paid for a half interest in Financial Sensation making him a \$60,000 bull; and \$25,000 which was paid for Golden Fern's Noble. The high figure for a Jersey cow is \$10,099, paid at a public sale for Sophie's Agnes.

American Jersey Cattle Club, 322 West 23rd Street, New York City.

Kerry and Dexter. These are two forms of the smallest of all dairy breeds; bulls weigh from 800 to 1,000 pounds—about the same as Jersey cows—and cows, from 500 to 600 pounds. These breeds originated in Ireland where hardiness and easy keeping qualities have earned them the title of "the poor man's cow." The true Kerry is always black and is of strictly dairy type; considering its small size it



FIG. 80. A full grown, registered Dexter cow

is a good producer even when kept where the pastures are poor and the climate is severe.

The Dexter-Kerry is a smaller form, solid black or solid red in color, tends toward the beef type, and in general yields less milk. However, the cow Slane Clara 3 has a year's record of 9,046 pounds of milk testing 4.26 per cent fat, and an average yearly production for 4 years of 7,564 pounds. Though offering the advantages of small size, easy keeping qualities, and fair production, these cattle are not commercially important in the United States, being represented here by less than a dozen herds.

The American Kerry and Dexter Cattle Club, Columbus, Ohio.

UNITED STATES CATTLE INDUSTRY STATISTICS

By PROF. C. S. PLUMB, of the Department of Animal Husbandry, Ohio State University, who is known not only through his standard work, "Types and Breeds of Farm Animals," but also through his personal instruction and activity along live stock lines.—EDITOR.

AS A MATTER of convenience and on a basis of use, cattle are divided into two great groups, namely: "dairy cattle"—those devoted to milk production and "other cattle"—those grown primarily for meat. In the early days of agricultural development in the United States, the second type was by far the more important; large numbers of steers were also used for plowing and other heavy, slow draft work. Gradually, however, the increase of population and the development of large cities with their immense demands for milk have resulted in a great increase in the number of dairy cattle and a corresponding, relative falling off in numbers of beef cattle. According to the Thirteenth Census of the United States dairy cattle increased 20 per cent in numbers and 15 per cent in value per head between 1900 and 1910; cows and heifers not kept for milk production

increased only 4 per cent in numbers, and bulls and steers *decreased* 21 per cent in the same period.

The following table gives Census figures (which are actual reports) and Department of Agriculture figures (which are estimates) showing the importance and trend of our cattle industry between 1870 and 1919—nearly half a century.

YEAR	MILCH COWS			OTHER CATTLE		
	NUMBER	VALUE PER HEAD JAN. 1	TOTAL FARM VALUE JAN. 1	NUMBER	VALUE PER HEAD JAN. 1	TOTAL FARM VALUE JAN. 1
1870	8,935,332*	\$32.70	\$ 330,175,000	13,566,005*	\$18.87	\$ 290,401,000
1880	12,443,120*	23.27	279,899,000	22,488,550*	16.10	341,761,000
1890	16,511,950*	22.14	353,152,000	33,734,123*	15.21	560,625,000
1900	17,135,633*	31.60	514,812,000	50,083,777*	24.97	689,486,000
1906	19,794,000	29.44	582,789,000	47,068,000	15.85	746,172,000
1907	20,968,000	31.00	645,497,000	51,566,000	17.10	881,557,000
1908	21,194,000	30.67	650,057,000	50,073,000	16.89	845,938,000
1909	21,720,000	32.36	702,945,000	49,379,000	17.49	863,754,000
1910	20,625,432*	35.29*	727,802,000*	41,178,434*	19.07*	785,261,000
1911	20,823,000	39.97	832,209,000	39,679,000	20.54	815,184,000
1912	20,699,000	39.39	815,414,000	37,260,000	21.20	790,064,000
1913	20,497,000	45.02	922,783,000	36,030,000	26.36	949,645,000
1914	20,737,000	53.94	1,118,487,000	35,855,000	31.13	1,116,333,000
1915	21,262,000	55.33	1,176,338,000	37,067,000	33.38	1,237,376,000
1916	22,108,000	53.92	1,191,955,000	39,812,000	33.53	1,334,928,000
1917	22,894,000	59.63	1,365,251,000	41,689,000	35.92	1,497,621,000
1918	23,310,000	70.54	1,644,231,000	44,112,000	40.88	1,803,482,000
1919	23,467,000	78.24	1,836,055,000	44,399,000	44.16	1,960,670,000

* Census figures; others are estimates made by the Department of Agriculture.

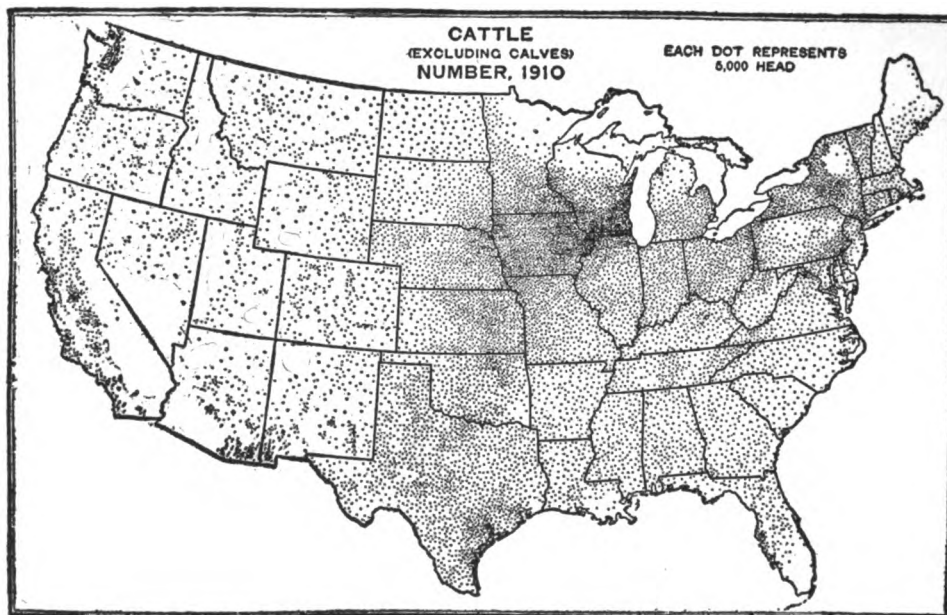
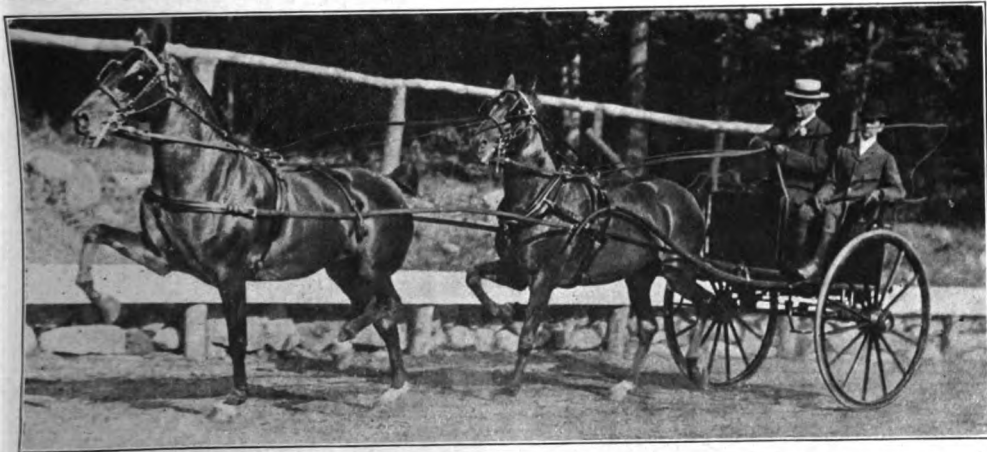


FIG. 81. Cattle and level, productive land naturally go together. Only where good crops can be raised can cattle be profitably grown; only where livestock are kept can soil fertility be economically maintained (1915 Year-book, U. S. Department of Agriculture).

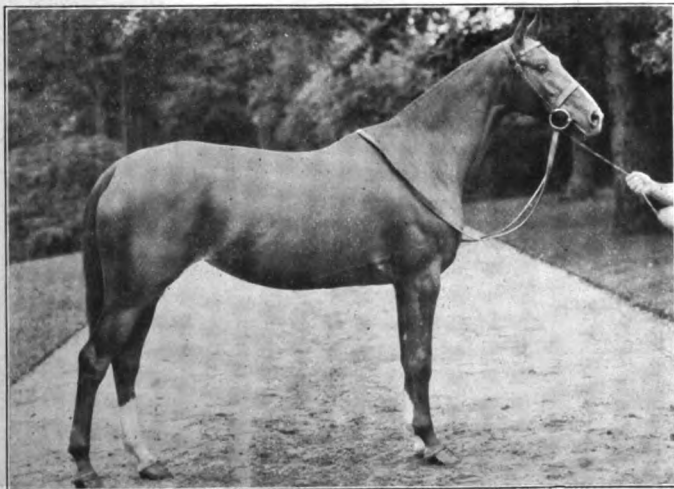
THREE FOUNDATION
BREDS OF HORSES
DEVELOPED ACROSS
THE SEAS



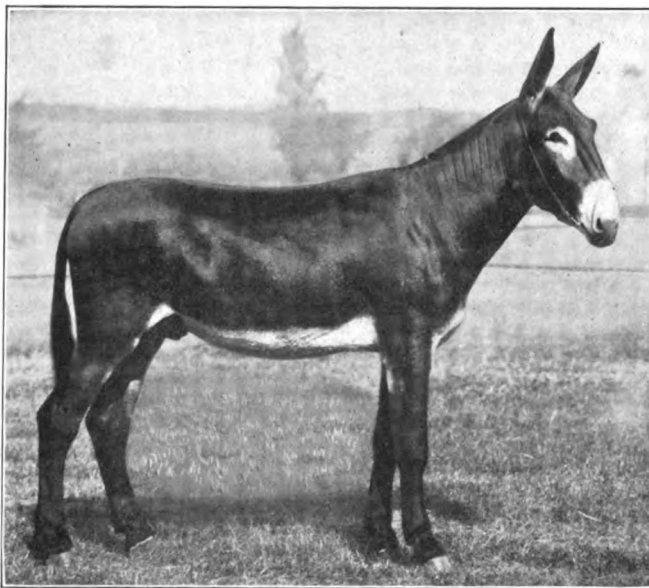
The Arab



The Hackney

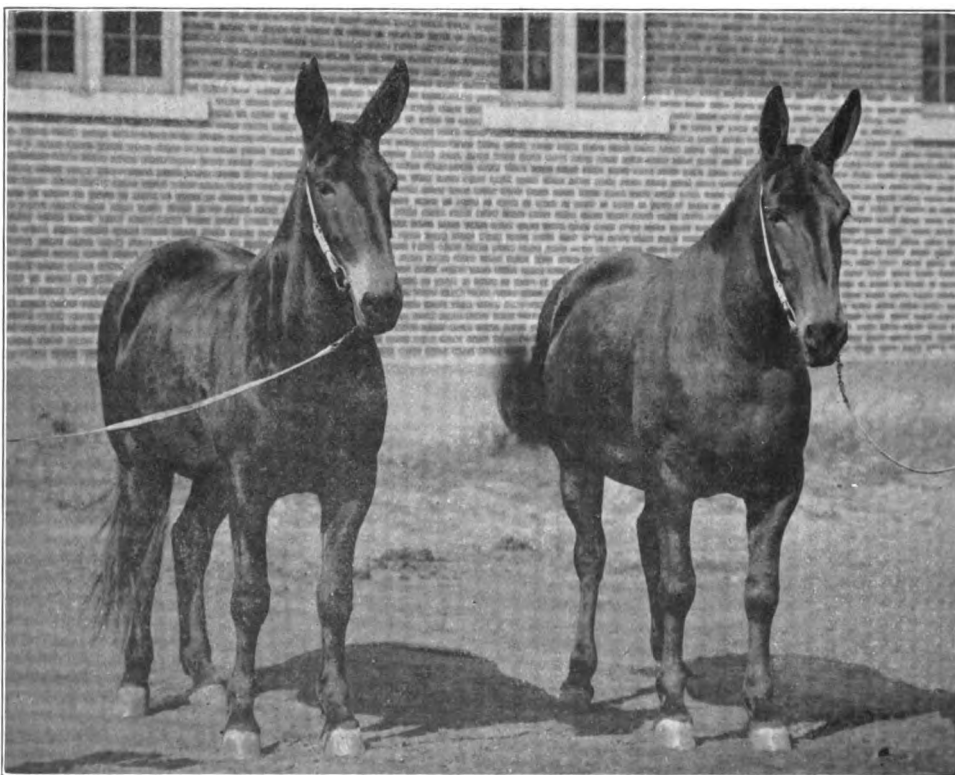


The Thoroughbred



"In ol' Virginny"

American or
Mammoth jack



Span of well-proportioned mules

TWO STRICTLY AMERICAN PRODUCTS

It will be noted that, although there were only about 23 million milch cows in 1919 as compared with some 44 million other cattle, the value of the former, \$1,836,055,000 was nearly as great as that of the latter, \$1,960,670,000. The total cattle interests for that year include 67,866,000 animals representing a valuation of more than 3½ billion dollars.

The distribution of these cattle is pictured in Figs. 81, 82, and 83. In a general way the dairy cattle interests (except in Texas) tend to concentrate in territory near to or east of the Mississippi River, while beef cattle are more thickly scattered over the less settled and cheaper lands west of this river. Of course there are many dairy herds clustered fairly near all the large cities; of course, too, these are associated with relatively small, carefully cultivated farms. Beef cattle in different instances or at different stages of their development may be found either on the wide open ranges of the west, in a few scattered eastern regions where they are finished largely on grass, and in the feed lots of general or specialized farms in and around the "corn belt."

The 10 leading states based on numbers of cattle of each type, together with their total and average (per head) values, according to estimates of the Department of Agriculture for January 1, 1919, were:

DAIRY COWS				OTHER CATTLE			
STATE	NUMBER	TOTAL VALUE	AV. VALUE	STATE	NUMBER	TOTAL VALUE	AV. VALUE
Wis.	1,808,000	\$147,846,000	\$82.00	Texas ..	3,961,000	\$145,765,000	\$36.80
N. Y.	1,478,000	131,542,000	89.00	Neb.	2,940,000	146,706,000	49.90
Iowa	1,381,000	118,766,000	86.00	Iowa	2,861,000	150,489,000	52.60
Minn.	1,368,000	106,704,000	78.00	Kan.	2,401,000	126,533,000	52.70
Ill.	1,060,000	95,400,000	90.00	Mo.	1,782,000	88,031,000	49.40
Texas.	1,060,000	66,780,000	63.00	Cal.	1,650,000	79,530,000	48.20
Ohio.	1,030,000	86,005,000	83.50	Minn.	1,632,000	54,672,000	33.50
Penn.	979,000	83,215,000	85.00	Okla.	1,444,000	63,825,000	44.20
Kan.	964,000	78,084,000	81.00	Wis.	1,436,000	53,132,000	37.00
Mo.	919,000	68,006,000	74.00	Ill.	1,367,000	73,818,000	54.00

The magnitude of the cattle trade in America is strikingly shown by figures for the business transacted in some of the larger stock yards. The Union Stock Yards in Chicago, the most important and much the largest cattle market in the world, received in 1916, 2,730,176 head of cattle valued at \$244,453,854. The 118,459 cars containing cattle received there in that year placed end to end, would make a solid train 807½ miles long. The Chicago yards have a daily capacity of 75,000 cattle, and in one year more than 3½ million head, not including calves which in 1916 totaled 519,624, have been received there. The other important stock yard receiving points of the United States are Kansas City and Omaha, Neb.; St. Louis and St. Joseph, Mo.; Sioux City, Iowa; St. Paul, Minn.; Buffalo, N. Y.; Indianapolis, Ind.; and Fort Worth, Tex.

The future. Within recent years the production of cattle in the United States has not kept pace with the increase in population. This has been due to various factors, especially the irrigating, dry farming, and fencing of the range, and the great increase in land values and cost of feeding stuffs in the north central and eastern states. In 1904 we exported 593,409 live cattle valued at \$42,256,291, and \$36,000,000 worth of dressed or cured beef. From 1904 to 1913, just before the opening of the great war, our export trade in cattle steadily declined to 24,714 head of live cattle, and \$17,338,000 worth of beef, dressed or cured. In 1913 we imported more than \$6,000,000 worth of live cattle from Mexico and elsewhere.

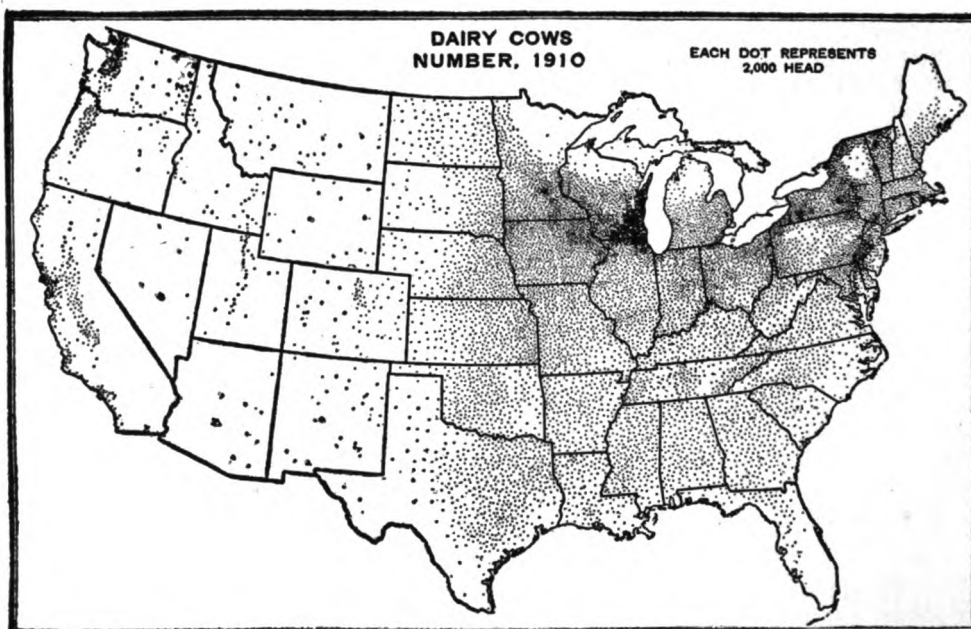


FIG. 82. Dairy cows are the "society folk" among cattle. They gather near large city markets; they receive the best of feed, shelter, and care; they attract the attention and capital of wealthy men. But they are the backbone of an immense farm industry too (1915 Yearbook, U. S. Department of Agriculture).

Since the opening of the war in 1914 the meat stocks of the world have become materially depleted, and values have steadily risen. Since 1911 average prices per hundred for beef cattle on foot have increased from \$4.47 to \$6.48 quoting figures of the United States Crop Report, while the prices for choice grades of cattle reached around \$18.00 per hundred in 1918. Milk and its products have also gained greatly in selling value during the past ten years, and since 1914 have come much into demand in the export trade.

The greater relative increase of population to production in the United States would naturally strengthen both demand and price. The war situation has intensified this situation, and to-day, as a people we are hardly able to provide ourselves with the necessary meat supply, to say nothing of an export trade. The present demand is for a material increase of our herds, with an effort on the part of the stockman to supply the American market, and also to contribute liberally to the support of those foreign markets that are calling for our food stuffs. It will be a more or less slow process of growth, but the reward is two-fold—a larger margin of profit, and a much needed contribution to the world's food supply. Intensive farming, the use of the silo, and the keeping of animals of a profitable type, will materially assist in securing the desired end.

Cattle Throughout the World

Fig. 72 shows the distribution of all kinds of cattle throughout the world. The important producing regions are, clearly: Europe (especially the western part), India, the United States, and east central South America. The cattle of India, however, are largely burden bearers and draft animals rather than improved beef or milch stock so the importance of the country is less than it appears. England and eastern Europe represent mainly intensive farm conditions; South

America, on the other hand, is almost entirely a land of open ranges; while the United States, as pointed out above, includes both types of animal husbandry. It must be remembered, further, that these data represent in the main peace conditions. At the present writing and at the close of the war, things may take on a different aspect. The most recent official figures for the more important cattle producing countries are:

COUNTRY	DATE OF CENSUS	NUMBER	PER CENT OF TOTAL
India	1913-1914	137,278,000	35
United States	Jan. 1, 1916	61,441,000	18
Russia	Summer of 1912	57,896,000	12
Brazil	1912-13	30,705,000	8
Argentina	Dec. 31, 1912	29,123,000	8
Germany	Dec. 1, 1914	21,817,000	5
Austria-Hungary	1910-1913	15,205,000	4
France	July 1, 1915	12,287,000	3
Great Britain	June 4, 1914	12,185,000	3
World (approximately)		385,000,000	100

The above ranking of countries is based on actual numbers of cattle. If, however, we take the number of cattle per 1,000 population we get an entirely different arrangement as follows: Uruguay, Paraguay, Argentina, South Africa, Australia, New Zealand, and Cuba; however, this is the result of few inhabitants rather than many cattle. On the other hand, in numbers of cattle per square mile, the Netherlands leads, followed by Belgium, Denmark, Uruguay, Turkey in Europe, Great Britain, Germany, and Switzerland.

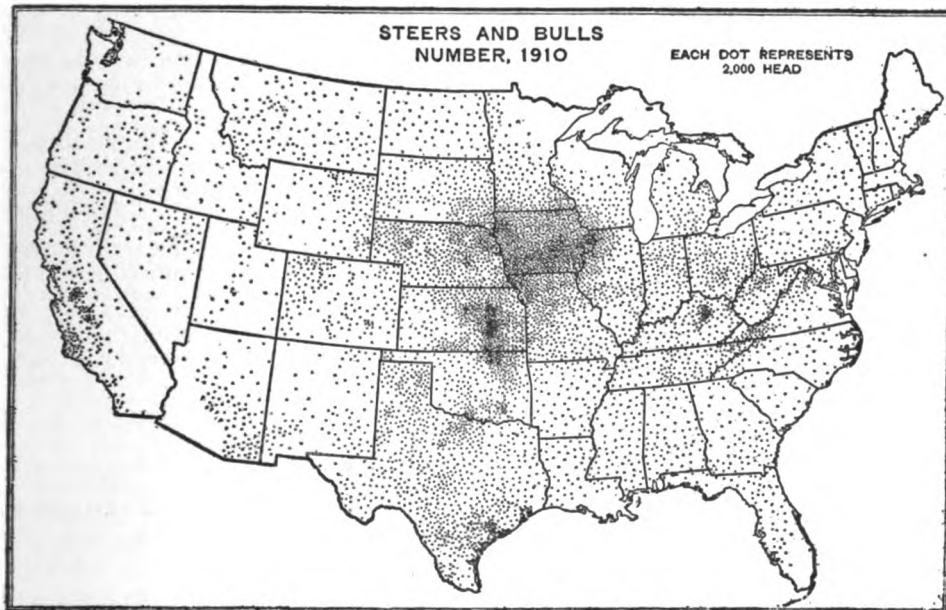


FIG. 53. The beef steer population centres in the corn belt feed lot, but smaller centres are found in scattered regions of rich pasture land as well (1915 Yearbook, U. S. Department of Agriculture)



SECTION THREE

SHEEP

CHAPTER 9



Sheep Raising—The Farm Flock

By ROBERT BLASTOCK, *Manager of Walnut Hall Farm, Donerail, Ky., since 1907, and President of the American Hampshire Sheep Association. His previous experience with sheep covers 10 years in England and 2 in New Zealand, all of which he has spent on the farm. A man's skill and knowledge are measured by the success they bring him; the success of Walnut Hall flocks on the farm, in the sales ring, and on the show circuit is proof of Mr. Blastock's ability to discuss this subject.*—EDITOR.

THE place for the farm flock. With the possible exception of the extreme type of "corn belt" farm, nearly every farm can profitably carry a few sheep—the so-called farm flock. Few farms do not include some waste land—gullies, hillsides, brush land, scrub pasture and other fields unfit for tillage. Unless sheep or other stock are kept, such land yields little or no income; sheep, of all classes of live stock, can best convert this possible waste into dollars. Even on farms in the best farming sections where land is high priced a small flock will pay if allowed to graze stubble fields, roadsides, and lanes. Indeed, there is scarcely a farm that cannot profitably support a small flock as a side line; coarse, cheap roughage forming the bulk of the winter ration and other steps being taken to keep down the cost of maintenance. If the farmer does not like sheep, then no conditions are favorable enough to justify their being kept.

Investment and returns. Under normal conditions a good grade ewe can be bought for from \$5 to \$8; purebred ewes cost \$20 to \$40 and a pure bred sire \$25 to \$40. With \$175 to \$200 a man can set up in the sheep business with a purebred sire and 25 grade ewes. This, of course, does not include the investment in buildings and equipment, but though this varies widely it can almost invariably be kept low.

The income derived from a flock of ewes varies with the grade of sheep kept and the care they receive. A good average figure would be \$8 per head, per year, but it may go as high as \$15 or more, depending largely on current prices and the locality. Under average conditions a fleece at 25 cents a pound should bring \$1.50; at wartime prices of wool one of like weight and quality would bring \$2.50. Seven cents a pound is a nice average price to receive for lambs weighing 80 pounds, or \$5.60 per carcass. If lambs are kept over winter and sold in the spring they

will not be worth much more, but the fleece will be taken off and with the manure will pay the cost of wintering. The demand today is for a tidy lamb fat at about 75 pounds. But many men who raise the slower maturing breeds like to keep the animals over one winter for the sake of the fleece.

Shall purebreds be kept? Relatively few men are naturally fitted to be constructive, purebred breeders. For those so qualified there is a rich field open, for flock headers will always be in good demand. For the average farmer, however, a market proposition will always be the most attractive, and in this work a flock of grade ewes and a purebred sire should be used.

Which is the best breed? There is no best breed; they are all good for the special purposes to which they are adapted. Choose that breed best adapted to your conditions. This involves, of course, a knowledge of the characteristics and history of the leading breeds.

The Farm Flock Season by Season

Getting ready for the breeding season. Assuming that the lambs have been weaned and the ewes dried up, the wideawake flock-master begins to look

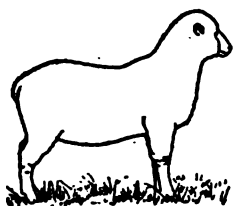


FIG. 84. A breeding ram of poor conformation. Contrast with FIG. 85.

forward to his next harvest time—the lambing season—and at once begins to prepare for it. The major portion of the income from a farm flock is derived from the sale of lambs, and the quality of the future lamb crop is largely dependent upon the condition of the ewes and ram at the mating season. Hence a little attention now will be well repaid in dollars later on. The breeding season on most farms

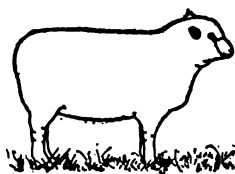


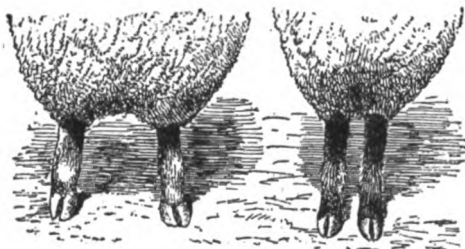
FIG. 85. A ram of the right type. Note back line, depth, soundness, and leg development.

will come in September and October, although in the extreme north it often extends well into November—much depending upon climatic conditions and the tendencies of the local lamb markets.

To make a long story short, it is most desirable to so manage that the ewes will be in the best possible thrift at this important time of the year; to this end they should be placed on a richer, more abundant pasture or given some grain for 2 or 3 weeks prior to the time the rams are placed with them. This practice—called by sheep-men “flushing” the ewes—causes them to improve in condition and thrift and, as one man has expressed it, “serves to bring the ewes to the breeding season on the upgrade.” In this way a greater percentage of twins is assured and the probable duration of the lambing period is shortened, as the ewes will come in heat and get with lamb more readily and uniformly. This is an important result, for the busy flock-master does not wish to be looking after newborn lambs during the greater part of the spring.

The care of the ram. The saying that the ram is half the flock is entirely true and should never be forgotten. He should be kept in a thrifty condition but not fat. He should not be allowed with the ewes except at breeding time. In summer the run of a good pasture is all that he requires. In winter he should be given a grain ration, some roughage, and some succulence such as silage or roots. (It is best not to feed mangels to rams because of their tendency to derange the urinary organs.) A pound a day of a ration consisting of 2 parts oats to 1 part bran, 2 or 3 pounds of roughage and a little succulence is all that is necessary at this time. In late summer a few weeks prior to the breeding season the ram should be given, in addition to his pasture, a small grain ration of the above feeds to bring about a vigorous bodily condition—not excessive fat but a good thrifty state of health. Rams should never be allowed to become run down because of lack of feed or from over-use in the flock.

The breeding season. On most farms the ram or rams will be turned with the ewes at breeding time. About 40 ewes is a reasonable number to allot to each ram, although if he is not well matured and vigorous 25 would be nearer the proper number. Ewes come in heat during the breeding season every 16 or 17 days and the rams should be left with them a sufficient length of time so that ewes failing to get with lamb by a first and even a second service can be given another trial.



Hand-coupling. On farms where the sheep constitute a more important part of the farm business the process known as “hand

FIG. 86. Desirable and undesirable types of breeding sheep viewed from the front. Narrow chest and legs close together indicate weak constitution and lack of vigor.

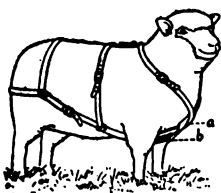


FIG. 87. Marking harness for rams. *a* Metal framework; *b* brush or pad holding paint.

is used to identify the ewes that are in heat. Paint or other coloring matter is placed on the breast of the ram used for this purpose so that he will mark each ewe that he attempts to breed, and a bib-like device is attached around his body to prevent him from really breeding them. At night these marked ewes are easily recognized and may be separated

from the others when the proper ram is allowed to serve them. Dry ewes are not profitable, so it is essential that all females be got with lamb if possible before the season is over. Various devices are used by different men in keeping a record of the flock with regard to the number of ewes that do not get with lamb at the first service. By placing a different colored paint on the ram's brisket between his forelegs every 17 or 18 days and noting which ewes are served more than once, the farmer can discover which ewes failed to get with lamb after their first, second, or subsequent heat periods. In general some sort of hand coupling if possible will aid greatly in keeping an accurate record and locating the dates upon which to look for lambs from certain ewes. One effective service is much to be preferred to a condition where the ram wears himself out serving a ewe at frequent intervals as long as she remains in heat.

coupling" is often practiced. The rams are placed in a lot where they can get plenty of green feed and exercise during the day and at night are turned with the ewes and allowed to serve once those ewes that are in heat. These are then taken out and placed with ewes already bred. Oftentimes a "teaser"

Great care should be employed at mating time for then the course of the flock's development is determined. Always use a ram that is strong where the ewes are weak. At this season the flock-master is a moulder of animal life and he should have an ideal type in his mind toward which he works at all times.

Winter Management

Housing. The entire winter management of the flock should be carried out with three objects uppermost in mind: (1) the maintenance of the health and bodily vigor of the ewe; (2) the growth and delivery of a robust lamb and (3) the production of a superior fleece. In this connection the first question that arises in the mind of the farmer who has invested in a small flock of sheep is what sort of winter quarters are best adapted to their needs. In this country there is more danger of over-housing than of under-housing the flock and this is particularly true in the case of the man who is new to the sheep business and unfamiliar with the needs of sheep. The farm flock requires no protection from cold alone but it should be protected from winter rains, cold winds and draughts.

One of the great arguments in favor of sheep is the fact that they do not require such expensive buildings and equipment as many other classes of live stock. A shed open to the south, with dry footing, is all that is necessary until the near approach of lambing time, when warmer quarters will be required for the new-born lambs if lambing takes place during the late winter or very early spring. Basement barns such as are common in the North do not provide a desirable place for wintering breeding ewes. The result of over-confinement will be revealed in the lamb-crop; the lambs will be weak, puny, and lacking in vitality. If no open shed is available and the expense of building one is too burdensome, a straw shed, built of poles and

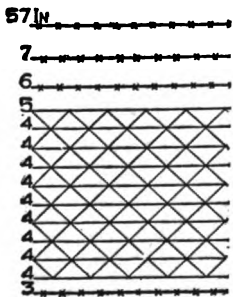


FIG. 88. A dog-proof fence. The bottom strand (of barbed wire) should run close against the ground.

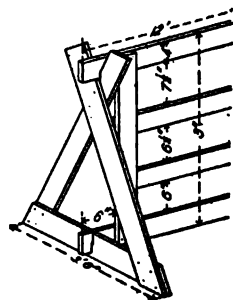


FIG. 89. Part of an easily made, movable hurdle for fencing sheep.

covered with straw, may be put up to answer the purpose. In many parts of the country ranging from southern Pennsylvania, the Virginias, and Kentucky to other states farther south sheep run out practically all winter with little or no shelter until lambing time.

Ewes in winter. Too much attention cannot be given to the care of the ewe-flock in winter. If possible the vigor of the ewe should not only be maintained but actually increased as lambing time approaches. Many men are led to believe that a flock of sheep is doing well because they *look* to be round and fat. The only way to actually determine the condition of a sheep is by handling; under the experienced hand the difference between a flock judiciously fed and one being wintered on oat straw becomes apparent.

Pregnant ewes must have nourishing food, succulence, fresh water, exercise, and a dry footing. It is difficult to state just which of these requirements is the most important; it is the proper proportioning of each and the blending of all that serve best to bring the ewe to the time when she is to deliver a lamb that will return a profit to the owner, and to the time when she will yield a fleece which, when sold, will pay all the expenses of her up-keep. Right here it might be well to say that sheep, like any other class of livestock, cannot be handled successfully by any rule. Shepherding is a fine art and experience is the reliable teacher; no two animals have the same identical requirements; it is important to know that the treatment and management must fit the case. Ownership will often open a man's eyes to the needs of his animals.

The feed of the in-lamb ewe should possess considerable bone and muscle-building constituents, as the unborn lamb in its development is continually making demands upon the ewe for such materials. Clover and alfalfa hay, bran, oats, oilmeal, and oil cake all have great value as sources of these food elements. Silage or roots will furnish the succulence but wherever possible it is well to have winter grazing of wheat, rye, oats, vetch, or some other such crop. Clover hay and silage combine to make an excellent ration, but a bit of grain should be fed along with this if best results are to be obtained.

Cornstalks scattered over the field a considerable distance from the barn will have a tendency to induce the ewes to take much needed exercise; the more they can be kept afield the better. It is a fallacy that sheep do not require water; tests have shown that sheep drink large quantities even in cold weather if it is available. The fact that under some conditions sheep will do fairly well for long periods with little water is no reason for intentionally depriving the flock of plenty of pure water at any time. As lambing time draws near watch the flock closely and place those ewes that appear to be the farthest along (this can best be told by the filling of their udders) each in an apartment or pen by themselves so that when they lamb the young will have a better chance.

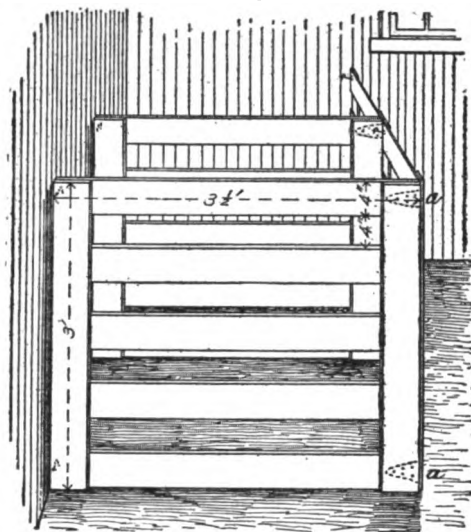


FIG. 90. Arrangement of hurdles in lambing barn to form individual pens. Each is hinged on the inside (a), so that it can be hooked to the wall and the next hurdle.

Lambing time. Lambing time is the flock-master's harvest and the time when attention to detail pays big dividends. Do not forget that the care of the flock at this season is a "lantern-in-hand" job. Ewes that have had proper care during the winter will generally experience very little difficulty at the time of the delivery of their lambs and with few exceptions will own them. It is the ewe that has been half starved and neglected that comes to lambing time with little milk for the young lamb and the inability to raise it properly. The ewe with a large supply of milk seems to have a greater mother-love than the poor milker.

The lambing barn should be divided as nearly as possible into 3 general apartments, one for the main flock of ewes that are farthest from lambing, one for the ewes right at lambing, and one for the bunch of ewes already lambled. Hence in a well regulated barn there is in progress a continual moving-up of ewes. Go over the ewes each night and take out and place by themselves the ones that are nearest to lambing, preferably placing each in a small pen that can be made of two hinged panels set up in the corner of the barn or shed in the form of a letter "L." In a series of such pens placed in a row along one side of the building the wall forms one side of each and the panels the other three. It is unnecessary to keep the ewe and her young in such a pen for more than 2 or 3 days; a shorter time will suffice if space is limited. It merely serves the purpose of getting the ewe and her offspring acquainted and in case of twins prevents the first-born from wandering away and getting lost while the second is being delivered.



FIG. 91. Docking a young lamb

Yeanning. The signs of approaching parturition are unmistakable. Generally speaking the ewe about to lamb appears uneasy—gets up and lies down frequently, and often apparently looks for her lamb before it has been dropped. "Nature is the best mid-wife" and only experienced shepherds should attempt to help the ewe in lambing. Aid should always be given *with* the straining of the ewe and not during the intervals between the periods of labor. There are many malpresentations at lambing time. In most cases get the lamb into normal position and normal birth will follow. Remember that there is always room back in the lamb-bed where the lamb started; if the ewe is raised by her hind quarters the lamb will tend to fall

back there, and its position can then be rearranged much more easily.

A lamb up, with the phlegm removed from its mouth and its stomach full of milk, is well on its way toward a ten dollar bill. If the attendant is about when the lamb is dropped he should see that it gets its first meal and that there is no excess wool about the udder to bother it; setting the ewe on her rump and starting the milk is a short job and it may help get the lamb quickly on to his feet.

Newly-lambled ewes require different feed and care from the remainder of the flock. The first feed after a ewe has lambled should be light; a handful each of bran and oats is all that is necessary for the first day or so provided she has access to grass, clover, or alfalfa hay. Light grain feeding at this time will remove the danger of trouble from an excess of milk; of course as the lamb increases in size the more milk the ewe gives the better. If the lamb does not take all the milk, the ewe should be milked out until the lamb is able to take it all. Silage, with other roughage, is a good feed for increasing milk production; more can safely be fed after lambing than before. A safe limit at this time is 2 pounds a head a day.

Care of young lambs. Very often ewes lose their lambs and it becomes desirable to place another ewe's lamb on the lambless one. To get the foster mother to own the new lamb, the skin of the dead offspring may be placed on it, or the ewe and lamb may be placed in a small pen by themselves until she will own it. In cold weather chilled lambs are a source of trouble. In case a ewe has twins and the weather is extremely cold, the first lamb should be cared for until the mother is able to attend to both. Lambs can be kept warm by wrapping in sacks or blankets; those that have become thoroughly chilled can generally be revived by dipping them in warm water; a few drops of whisky given internally will sometimes help. When a lamb is first dropped rub its back and sides with an old burlap sack to hasten its circulation and dry it off, thus lessening the chance of its becoming chilled. After the lambs are born it is too late to close up the barn, but if the cracks of the walls are filled with straw and the barn is tightly closed up before lambing begins, and if the room is not too large, the heat from a few sheep will warm the air enough to prevent the newly dropped lambs from becoming chilled. Once dry, the lamb can stand a great deal of cold. Reviving a drooping lamb is at best an unsatisfactory task; preventing conditions that make it necessary by careful attention to detail is far more satisfactory.

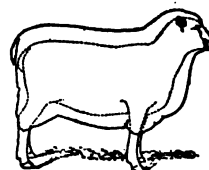


FIG. 92. Diagram to show relative outlines of sheep before and after shearing.



FIG. 93. Convenient type of shearing machine

Shearing Time

In the management of the farm flock, shearing (Chapter 47) is a spring job. The exact time depends largely upon climate and other general farm conditions. Shearing is better done after lambing than before. If the latter is necessary, handle the ewes very carefully. Choose a warm day for the work. In any case sheep should not be shorn until the yolk has begun to rise in the fleece. Farm wool is usually sold by the lot and not on a scoured

basis, and nowadays sheep are not generally washed before shearing.

In the actual shearing operation the fleece should be removed without tearing it to pieces. Keep it intact and as free from dirt and other foreign material as possible. Also avoid scarring and unduly cutting up the body of the sheep. A clean spot or platform should be chosen for the shearing place and kept clean by frequent sweeping. Machines will clip the wool closer than the old-fashion shears. In taking off the fleece avoid second cuts, that is, cut close to the skin the first time over in order to get as long a staple as possible. The fleece should be rolled up with the outside wool on the inside and tied with wool and paper twine, never with sisal or other twine with vegetable fibres that would get into the wool. Wool boxes may be used but are unnecessary as the wool may be rolled up loosely and make just as satisfactory a fleece. Keep the wool free from dirt and tag-locks; the latter should be kept by themselves and sold separately. The old idea and practice of enclosing bricks, stones, etc., in the fleece is entirely out of date.

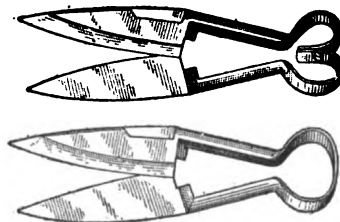


FIG. 94. Two types of hand shears

Fitting for Market

As time goes on the process of getting sheep ready for market is becoming more and more a lamb producing proposition. Probably 80 or more per cent of the sheep found on the market to-day are lambs. The farmer with a small flock of sheep is interested, therefore, in producing lambs which put upon the market will return him a maximum profit. In this day of high-priced feed make lamb production as nearly as possible a grass and milk proposition; market the lambs milk fat before they have had a chance to run a feed bill up to prohibitive figures. Lambs produced for a special market such as "hot-house" lambs will require some supplementary grain—crushed oats, wheat bran, finely ground cornmeal, and oilmeal make an excellent mixture for them. The man who keeps show sheep will also profit by keeping his lambs growing at all times, but few general farmers will undertake the production of sheep of these latter two classes.

In certain specialized communities and on the farms of specialists a certain number of older lambs, yearlings, or older sheep will be fed out or finished for the market. Wheat screenings, corn, dried beet pulp, oats and various grain mixtures along with roughages have all been used in this work. Corn is the universal fattener and always will be; certainly the major part of all mature sheep feeding has been accomplished with corn as the foundation, other feeds serving as supplements. Of course much depends on local conditions and the price of available feeds. Modern markets favor a lamb weighing from 68 to 80 pounds. Small cuts are in demand—lambs to be most profitable must possess early maturity, finish, and quality.

Fitting for the Show Ring

Fitting sheep for the show ring requires shepherding ability which is largely a product of experience. This ability, coupled with clover hay, roots, oilcake, oats, bran, barley, corn, and plenty of exercise and fresh water and applied to sheep of good individual quality has made many prize winners. Most sheep of the mutton breeds shown nowadays are trimmed before being shown. This practice, which requires considerable practice and skill, merely smooths up the animal,

covers up the weak points and gives the fleece a more pleasing, dense, compact appearance; it is merely a show ring custom and has no material effect on a competent judge. All good fitters practise the principles of punctuality as to time of feeding, cleanliness, gentleness, and consideration of the individual needs of each sheep. Show sheep to win must have considerable finish and bloom, and must be firm in the quality of their flesh covering.

Some Important Factors in Shepherding

Keeping the flock healthy. Sick sheep are hard to treat, hence the management of the flock should be such as will reduce their liability to sickness. This result is best accomplished by keeping the ewes in flocks not to exceed 100, changing pastures frequently, and giving plenty of range. Keep all sheep, but lambs in particular, on plowed ground such as seeded forage crops and winter grain as much as possible.

Docking and castrating. The question often arises in connection with the production of market lambs: Shall they be docked and castrated? All lambs, with the exception of the hot-house or winter lambs, should be docked and castrated. Best results come when lambs are castrated at 2 or 3 weeks of age and docked when from a week to 10 days old. For docking the hot iron has proved very satisfactory, but little blood being

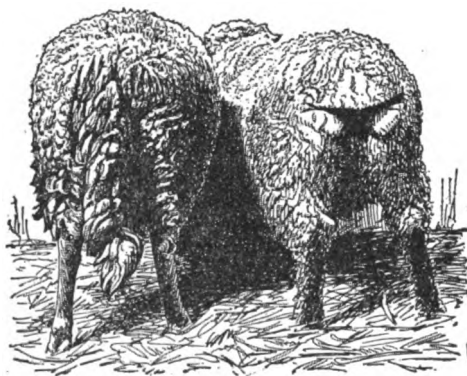


FIG. 95. How docking and trimming result in a better fleece, increased cleanliness, greater comfort for the sheep and greater convenience for the shepherd.

lost when it is used. In castrating cut off the end of the scrotum, cut through the membranes covering the testicles, push back the membranes, draw out the cord as far as easily convenient and scrape it in two with the edge of a knife. Some sheep men, especially in the west, pull out testicles cord and all by the roots, using the teeth to secure a firm hold on the testicle.

Dip sheep once a year. To rid sheep of lice and ticks dip them at least once a year using one of the reliable commercial dips and following instructions obtained with it. Use an ordinary hog dipping vat or tank (see Vol. III). The best time to do this is soon after shearing before the fleece gets too long; less dipping fluid is used and the process is more effective. The entire sheep should go under the surface of the liquid.

Trimming the feet. Sheep kept confined or on soft ground must have their feet looked at, at least three times a year to see if there is an excessive growth of hoof. In the case of rams this is most important as the horn of the hoof will grow out, spoiling the shape of the foot and the set of the leg and making the sheep more liable to foot infection caused by an accumulation of filth in the pocket thus formed. Turn the sheep up on its rump, reach over as in a shearing position and with a sharp knife trim the growth of horn back even with the bottom of the foot (Fig. 96).

Marking sheep. Every farmer should have his flock mark. Perhaps the most satisfactory method of marking sheep is the use of a sheep branding fluid that will be removed when the wool is scoured. Ordinary paint should *not* be used. A mark made on the side or back of the sheep will serve to identify the animal—if a circle is desired a tin-can that has had the top cut out will make an excellent mark of this kind after being dipped in the branding fluid. Ear labels are satisfactory but the sheep must be caught to determine the number. Notching



FIG. 96. Holding a sheep and trimming its overgrown hoofs

the ears may also be done, especially in the case of lambs.

Reminders. Flush the ewes before the ram is turned with them. Don't use scrub sires—they are too expensive. Don't use too immature a sire in a large flock. Don't confine the ewes and lambs on old, infected pastures. Change pastures frequently. Don't over confine the ewe flock in winter—it needs exercise. Get the lambs off on the early market. Don't forget the green feed during the winter months. Don't plunge into the business during booms only to quit when the depression comes.



FIG. 97. Three ways to ear mark sheep. *a* 2 kinds of metal tag; *b* a notching system; *c* a number tattooed into the ear



FIG. 98. A shepherd of the "early days" and his flock

CHAPTER 10

Sheep Raising—Range Management

By WILL C. BARNES, Assistant Forester, Branch of Grazing, United States Forest Service, who has combined thirty years' experience in handling animals on the open range, with a systematic study of modern grazing problems and their solution. With the development of irrigation and dry farming methods and the cultivation of vast areas in the West, the open range is being gradually wiped out, or rather crowded within the limits of the National Forests, where the management of herds and flocks comes directly under the eye and the authority of the Forest Service. Mr. Barnes writes, therefore, with a knowledge of things both as they have been, and as, under modern improved conditions, they should and are going to be.—EDITOR.

SHEEP as range animals. Since the days of Abraham sheep have been handled wherever possible by herding rather than in fenced enclosures. Indeed, their management under such conditions was one of the earliest industries of the world. Sheep raisers of old were a wandering people and sheep met their economic needs admirably; mutton was their staple food, and the wool and pelts supplied clothing, bedding, and tent coverings. Sheep were their favorite stock for many reasons: the percentage of increase is always greater than with cattle or horses; the period of gestation is shorter; they mature early and are far more catholic in their tastes than any other domestic animal, eating forage plants that cattle and horses will not touch; they tend by nature to stick together in flocks, they are easily handled and kept more closely under their owner's eye than cattle or horses; moreover, a marauding band of enemies could steal a bunch of cattle or horses and easily drive them away, whereas sheep could not be hurried in their travels.

Biblical references to flocks, tributes to rulers paid in sheep, religious sacrifices, etc., indicate that the grazing lands in early times must have been extremely fertile and of high carrying capacity, for herds from which such large numbers could be taken merely for sacrificial purposes must indeed have run up into the millions. In closely tilled regions in England, France, etc., sheep have naturally been merely an adjunct to the farmers' operations, and have necessarily been handled in small lots and under restraint. It has become a world-wide truth that "wherever the plough comes, sheep give way." It is equally true, however, that as the land comes more and more under cultivation sheep

return and find their proper place in the higher economy of farm life.

The Merino as the range breed. On the many areas scattered all over the world that are not properly fitted for agriculture, range sheep are holding their own as the most practical means of utilizing the forage crops that grow there. From such an arid, desert region in central Spain sprang the Merino sheep. Centuries of herding seem to have created in it a flocking instinct, a dependence upon man for guidance and control that no amount of crossing or breeding will wholly eradicate. This herding instinct is lacking in those English mutton breeds that have for centuries been handled entirely under

fences and that are extremely difficult to control in large bands; but cross into them the smallest possible amount of Merino blood and a single herder with his dog can manage them without difficulty. A bunch of coarse woolled sheep when startled by some unusual noise will scatter far and wide, but Merinos instinctively rush together as if for protection.

The Development of Western Sheep Ranching

The handling of sheep on the open, unfenced ranges of the West has been developed to a very high degree of effectiveness since (about 1541) the Indians of New Mexico came into possession of a small bunch of sheep brought up from Mexico by a Spanish exploring party under Coronado. The Indians took kindly to the sheep business and undoubtedly from this small beginning grew the great herds which later covered the plains country of Texas and eastern and central New Mexico. Soon after this the Spanish took sheep up into California and the range sheep business on the Pacific Coast grew mightily. Undoubtedly these two plants of sheep on the North American continent were Merinos brought by the Spanish from their own land which their new found home resembled very closely, as to both climate and the nature of its plant growth.

The Pueblo Indians of New Mexico were a people with permanent, well-built homes, who loved agricultural pursuits, and were peaceful and friendly in their relations with

outsiders; they found the sheep a great addition to their economic needs. Under the direction of the Spanish they learned to weave blankets and articles of clothing, which arts were later picked up by the outlying, warring Navajos who stole everything they could including women, children, and sheep, from their unfortunate neighbors. Eventually the Navajos began to raise sheep themselves, quickly learning and finally monopolizing the art and business of blanket weaving.

Range development. When the Americans came to the Pacific Coast they quickly saw the possibility of the sheep business and for many years great drives of sheep were made from southern California over the Sierras into Montana, and north into Oregon and Washington to stock up the wonderful ranges in those states. Meanwhile Arizona, southwestern Colorado and western Texas were being stocked up from the New Mexico herds.

Range costs. In the early days the cost of handling sheep on the ranges was very small. The herders—almost universally Mexicans—were modest in their needs, a few “frijoles” or Mexican beans, some cornmeal (generally ground by themselves in home-made mills) and a little sack of “chili” or red pepper with which to season it, was about all the food they carried with them, mutton furnishing the balance of their ration. Of tents, camp wagons, and cooking utensils they knew little. Half a dozen sheep skins used as pack blankets during the day served as beds at night; one or two burros carried all their belongings for trips that lasted

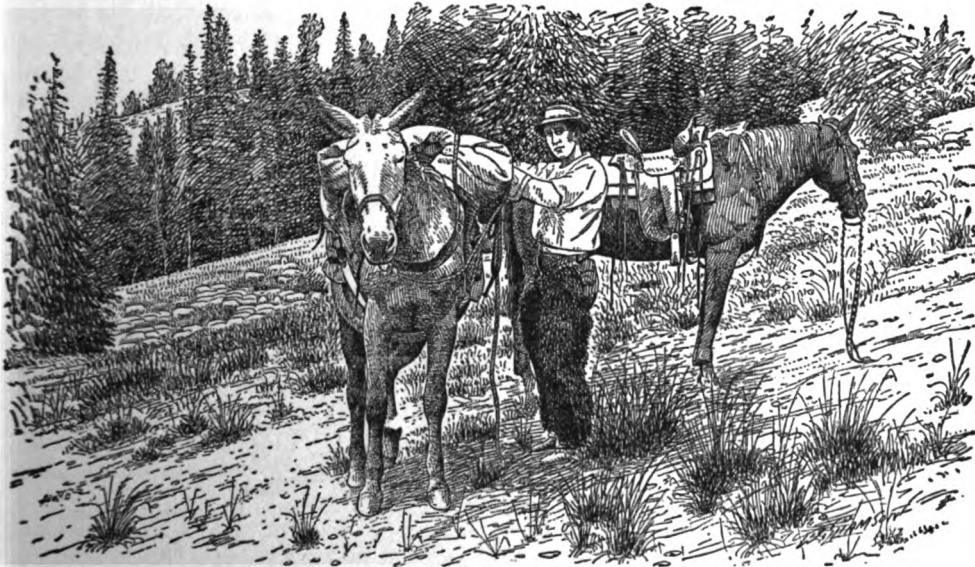


FIG. 99. A Basco herder of the Northwest and his outfit. See page 101

often for several months; only about once a year did they return to the home establishment either for lambing or shearing. As late as 1890 the cost per head of running sheep on the open ranges in Arizona and New Mexico was estimated at not over 75 cents, while several large Mexican owners who used native help and methods exclusively, placed it at not above 50 cents.

To-day the average cost per head in that region is much higher and is rising each year. Not only have the herders' wages and living expenses increased greatly, but the necessary investment in lands and equipment has grown very fast. A 1916 Government bulletin (Meat Situation in the United States, Part II) gives the following costs per head for open sheep grazing: Southwest, including Arizona, New Mexico, and Colorado, labor 61 cents, total cost \$2.00; Northwest—Idaho, Utah, Montana, Oregon, etc., labor

65 cents, total cost \$2.40; California, labor cost 55 cents, total cost \$2.50. In this connection "labor cost" includes shearing; "total" cost covers use of lands owned, winter feeding, depreciation, losses, etc.

Twenty-five years ago few sheepmen owned land beyond a small headquarters ranch where they raised a little hay for winter feed and a few head of work and pack stock. To-day the sheepman who has not provided himself with at least sufficient land on which to lamb his ewes and pasture his bucks can not hope long to remain in the business with profit. Furthermore, if he would hold his own and meet the competition for the surrounding ranges he must own as much land as he can possibly purchase on which to graze some if not all of his sheep during the critical periods of drought and short feed common to the Western grazing states.

The Herder and His Work

"Sheep herders are born, not made," a well-known Western sheepman once remarked, and the common idea that "any one can herd sheep," that it is a lazy man's job, requiring neither experience, judgment, wit, nor brains but only a stout pair of legs and ability to stand the lonely life, is very far from the truth. It is doubtful if there is any other agricultural work in which skill, good judgment, experience, and loyalty to the owner's interests on the part of an employee count for so much. The cash value of an average-sized herd of range sheep is at present more than \$15,000, and for months at a time the herder's judgment alone determines whether profit or loss shall come to the owner.

In the spring this valuable property is turned over to the herder who takes it into the high mountain ranges where, amid the solitudes of nature, he often goes for days without meeting a human being. He must see that his woolly charges find the very best of feed. If they are lambs and ewes the mothers must



FIG. 100. A Mexican herder ready to go out on the range with his burro outfit. Even his water supply has to be taken along

get the fresh, succulent weeds and plants that sheep love and that furnish the richest kind of milk for the little fellows who should be growing every minute of the time if they are to be in shape for early shipment. He must watch lest prowling coyote or bear take heavy toll from his herd. Not infrequently one of his flock gets caught between two logs or hung up in the fork of a fallen dead tree; if not noticed by the herder before the flock drifts on, it either dies very soon after struggling frantically or is found by coyotes. Little lambs have a way of dropping into the huge badger holes that are found so plentifully on many ranges, and even a prairie dog hole will often trap one of the little wobbly legged objects, the mother going right on and seldom noting the absence of her offspring. A careful herder keeps close track of the area grazed by his herd and saves many a dollar for his employer by rescuing such cases.

Often, too, a few animals will graze off to one side through a thicket or over a hill out of sight of the main herd to which they never think of returning when once separated from it. These straying groups are called "cuts," and a wide awake herder will count his "markers" at least once a day to see that none has been lost. A "marker" is one of the black sheep which seem to come in every crop of lambs, and a herder tries to have at least one to every 100 grown animals in his band. By running his eye over the sheep as they feed he can readily spot and count the markers; if all are there he feels reasonably certain he has had no losses, for the blacks are generally so well distributed through the herd that no "cut" can get away without taking at least one marker with it.

A good herder will recognize the leading poisonous plants on his ranges and as far as possible keep his sheep from grazing areas on which they are known to be plentiful. If he has driven them for any great distance where feed is scarce, as through the long, narrow driveways that must often be used to reach the National Forest ranges, until they are ravenously hungry, he will herd them away from thickets of choke cherry (*Prunus demissa*) or grassy meadows where grows the deadly death camas (*Zygadenus*). In the fall when the lovely lupine flowers fade and the seed pods are full and ripe he knows it means death to his sheep if they graze where this plant grows luxuriously, although it is good feed at other times.



FIG. 101. The "deadly death camas."

Mexicans and Bascos. Throughout the Southwest the Mexicans are the main source of help in the sheep camps. They are found in every sheep-raising region west of the Rockies and as a rule are faithful and willing workers, their forefathers in many cases having for generations followed the business, taken a pride in their work and brought up their boys to follow in their footsteps.

In the Northwest in recent years the Bascos or Bascos have become very numerous and proved splendid men with sheep. Like those of the Mexicans their ancestors—from the mountains of Spain and France—have been herders of sheep in their native land for centuries. The loyalty of the men of each of these nationalities to their employers and their woolly charges is remarkable. They will fight each other for feed for their flocks, steal it wherever and however they can, watch over their sheep day and night, stay with

them through blizzards and storms, risk their lives to guide them to safety and shelter, and suffer without hesitation or complaint privations that no other class of labor, except perhaps sailors, is ever called upon to endure.

In the mountains the herders are generally furnished pack animals to carry their camp equipment. On the winter ranges in the deserts large camp wagons take the place of the packs whenever they can be used. They are fitted with heavy canvas tops, small stoves, permanent beds, etc. With the sheep bedded down close by, a lantern swinging from the wagon bows overhead and a good fire in the little stove there is much comfort in these wagons, in which, during long winter nights many a sheep herder has laid the foundation for a good education while the wind howled outside and the coyotes answered the barking of his dogs.



FIG. 102. Keep sheep away from the lupine when its seed pods begin to form.

Herding methods. Very early in the morning the sheep leave the bed ground and start for the range. Ordinarily the herder starts them off in the desired direction, sending a dog to turn them if necessary, then gets his breakfast and follows them out on the range. If the day is pleasant they will be filled up by 10 o'clock and will seek shade under trees or in the lee of a cliff where, unless disturbed, they will remain for several hours.

In the evening the herder points them toward camp without disturbing them more than is necessary, drifting them quietly so they reach the bed ground camp just as the evening shadows are lengthening. Ordinarily the sheep will slowly graze together of their own accord, and, if nothing startles them, drop down to rest in a fairly compact body and often not move till daylight comes again.

Dogs are "taboo." Of late years the more progressive sheepmen have discouraged the use of dogs and many have absolutely forbidden herders to have them in camp for anything but companions or safeguards against attacks of predatory animals. The idea was not received by the herder fraternity with any great joy because dogs have saved many a weary climb up rough brush-covered mountain slopes to turn sheep back or check them when drifting too rapidly. If dogs are used with judgment no harm results, but in many cases an excitable young one eager to work and directed by a lazy, indifferent herder will dash into the sheep causing them to rush madly into mass formation, destructive alike to the feed and the welfare of the animals. Hence the dog as a herder is "taboo" with most progressive Western sheep owners.

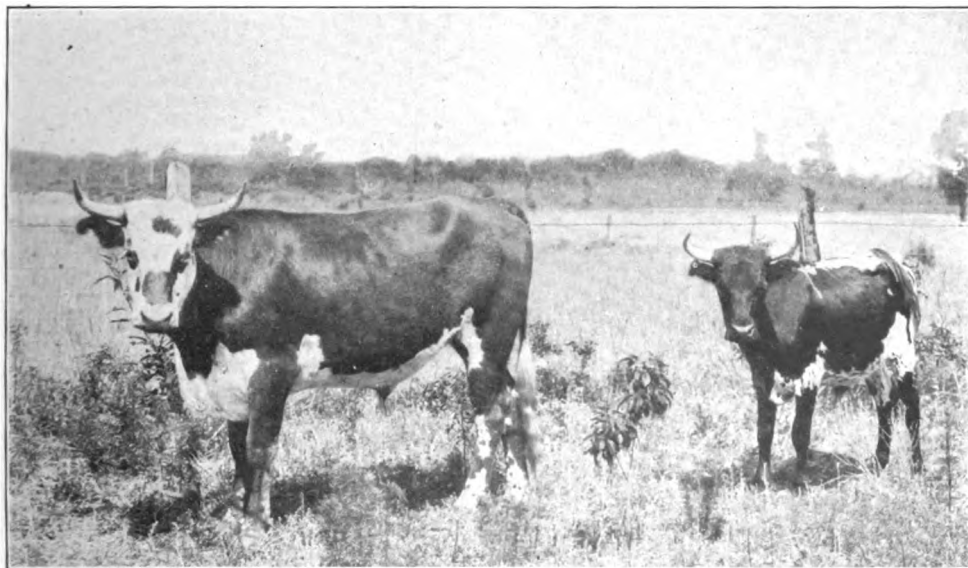
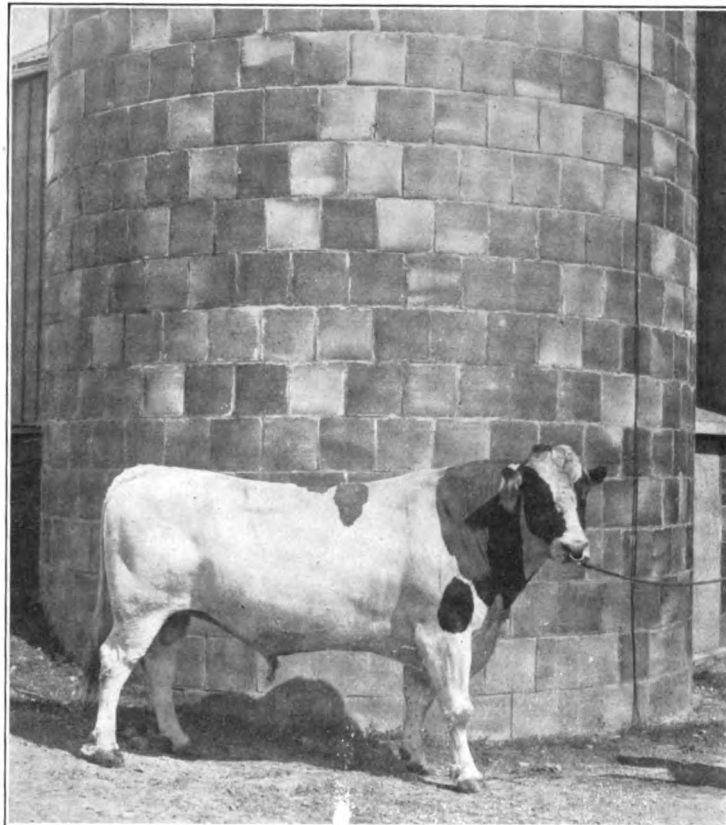
The New Herding System

Up to within recent years the general plan of handling sheep on the open range was based on a permanent camp located in some convenient part of the range where wood and water for camping purposes and shelter for the sheep were handy. The sheep were grazed in large bands, frequently as many as 3,000 grown animals, allowed to scatter out very little, and always kept under the immediate eye of the herder. Morning after morning they were driven out to feed and night after night brought back to the same bed ground, until the range for miles around was trampled into a dust heap. Then, and not until then, did the herder reluctantly move his camp to another spot there to repeat the same wanton outrage upon the range. Small wonder that the ranges were being spoiled with frightful rapidity and that on thousands of acres of the very best sheep ranges that man ever used the original forage plants had almost disappeared leaving only the coarser, unpalatable grasses and poisonous plants to take possession.

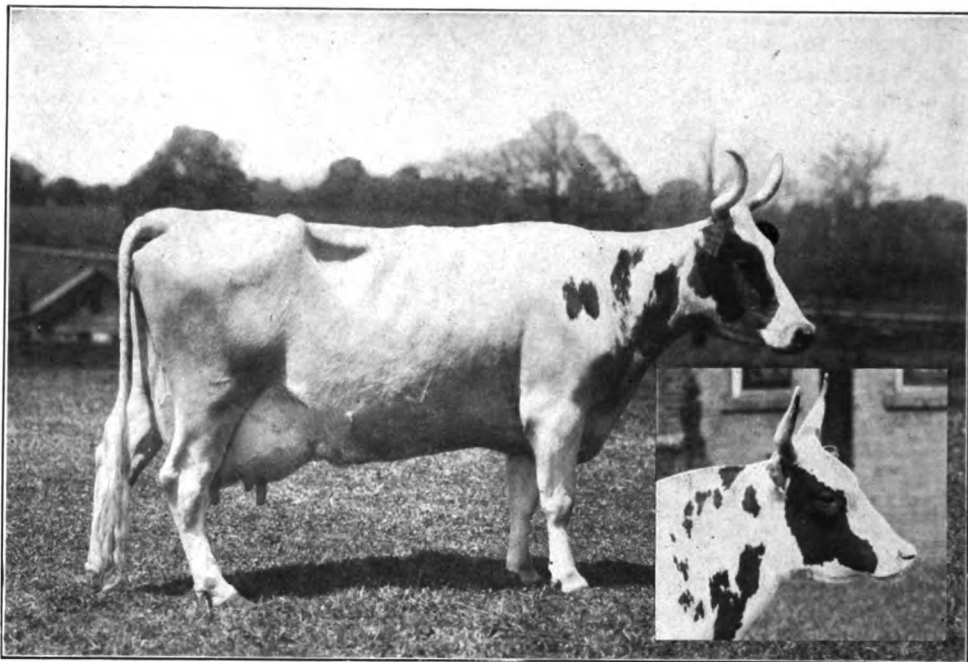
When the Forest Service took charge of the National Forest ranges one of the first steps taken was to prohibit these permanent camps and cut down the size of the herds. A herder was not to camp in one spot for more than 6 successive nights nor near running streams or springs or other watering places; 1,500 grown sheep was made the limit for most ranges and 1,200 for others. Naturally there was strong opposition to these two provisions. The herders objected to the 6 night proposition and the owners declared that to reduce the size of their herds meant ruin and was an economic mistake. But the Forest Service persisted and the two orders were strictly enforced.

**FOUNDATION STONES
ON WHICH TO BUILD
SUCCESS WITH CATTLE**

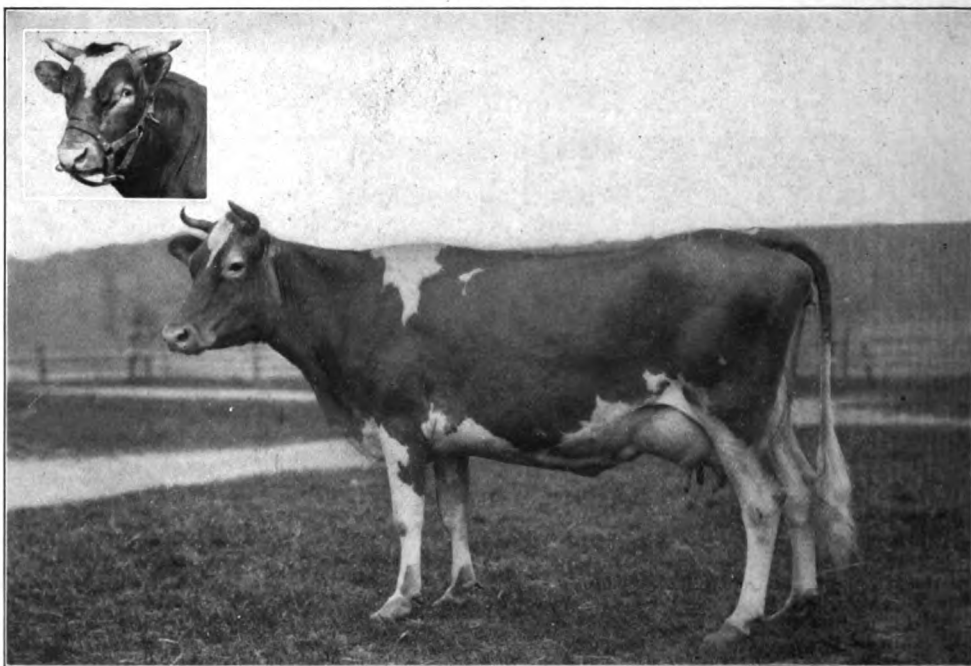
**A purebred bull
and a silo carry one
well along the road**



What pure blood does. These Florida steers are of the same age and were raised alike. The one on the left had a purebred sire; the sire of the one on the right was a scrub



The Ayrshire, distinguished by the white and red color, the large up-curving horns, and the uniform, conveniently sized teats



The Guernsey, recognized by the light-colored area around the eye, and the rich color of its products

THE LEADING DAIRY BREEDS—I

The "Open" system. Efforts were then made to secure the adoption of a more open system of herding. The animals were not to be returned to camp each night nor were they to be massed during the day, and dogs were not to be used in handling them. Briefly, the plan proposed by the Forest officers was to allow the sheep to take care of themselves to the farthest possible limit. The herder was merely to follow them out on the range, guide them in some certain direction with as little direct herding or driving as possible, and allow them (1) to scatter out as they chose, so long as they did not leave the particular range allotted to them on the Forest, and (2) to drop down wherever night overtook them even though they might not all be in one single band.

Again came a tremendous outcry from herders and owners. The former objected because the plan forced them to abandon their permanent comfortable camps and trail around after the sheep, packing their bedding and camp outfit on a burro or horse and letting the sheep instead of themselves select the camp. The owners found plenty of fault in no uncertain words, predicting all sorts of disasters to sheep so handled on Western ranges. "They will all be eaten up by varmints," was one strong argument. "Hundreds will be lost in cuts," was another. But especially they doubted the ability of any set of government officials to tell them how to handle their own property or improve on their methods. Had not their system been followed for 50 years with success? Everybody was getting along nicely, why the changes? Theirs was a policy of "let-us-alone."

But the grazing men of the Service, confident they were right and that the old methods were wasteful alike of forage and mutton, persisted. One of their first steps to educate the sheepmen consisted of grazing a few bands of sheep according to the new ideas. It was at first difficult to find an owner to furnish the needed animals, but finally one man, impressed with the enthusiasm and sincerity of the Forest men, provided them with several bands on which to work out the experiment on a large scale. That the rules might be strictly carried out a lot of wide-awake young Forest officers turned sheep herders for 3 years. Individual animals were weighed, conditions noted, ranges examined to see how they stood grazing, and every

action of the sheep, whether feeding or resting, carefully recorded. As a check one band was grazed in the same neighborhood and as nearly as possible under the same range conditions, but according to the old, close-grazing, permanent-bed-ground system.

After 2 or 3 years the results were so clearly in favor of the new "burro," "open herding," or "blanket" system that the sheepmen were convinced of the success of the plan. Not only was the weight of the sheep, and even of their lambs, considerably increased, but more and better lambs were raised; there was a slight increase in the weight of wool; the losses from predatory animals, cuts, and injuries were considerably less; and it was easily seen that a certain range could carry an appreciably larger number of sheep under this system than it could under the old methods, and still leave the range in better shape! Another point the experiments settled was the economy of the smaller sized herds; in every instance the smaller bands showed gains over the larger. All this spelled dollars and cents to the owners who lost no time in adopting the system until fully 50 per cent of the sheep grazing on National Forest ranges are now handled under this method; eventually all sheep on open ranges will be grazed under the "burro" system.

Grazing sheep without water. On the high mountain ranges sheep require but little water beyond that secured from dews and the soft lush feed. Under ordinary grazing conditions herders had been in the habit of driving their sheep to water at regular intervals, frequently forcing them down rough mountain sides or over difficult trails to reach water that probably they did not want, although in many cases they naturally were thirsty and drank after the hard drive to reach the watering place. With these facts in mind the Forest officers undertook other practical experiments running one band on a range where there was no surface water whatever and another on an adjoining range where the sheep could reach water whenever they wanted it, and weighing a number of animals in each band at the beginning of the test, several times during its progress and at its close. Those grazed for over 100 days without being watered weighed as much as the others and their fat was considered harder and firmer than those watered regularly. The range sheepmen were quick to profit by these experiments also.

Details of Range Management

Shearing and dipping. Before the lambs come the ewes are shorn and dipped. On a majority of the Western ranges machine shearing has taken the place of the old hand methods. As far as cost is concerned there is no great difference between the two. The great advantage of the machine is the rapidity with which it disposes of the sheep so they can be sent back to their ranges. A good active

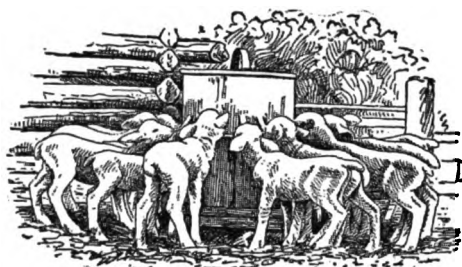


FIG. 103. A "galvanized iron ewe" and its adopted family

hand shearer will clip from 60 to 75 animals per day, while an average machine operator will easily handle over 200. The record for 8 hours is 341 grown sheep.

As far as possible dipping should follow shearing, for the results are more satisfactory when the wool is short. Not over 10 years ago scab was prevalent on almost every range in the West. Thanks to the activities and persistence of the Federal government agents it has been stamped out through systematic dipping

year after year until it is now almost unknown on the open ranges. The dipping is done in long, narrow vats into which the sheep are thrown and forced to swim for 50 or 60 feet; meanwhile their heads are "ducked" under the surface of the dip, so that every part of their bodies is soaked, by men standing along the vat. The dipping must be repeated 10 days later to kill any parasites from eggs that were unhatched at the time of the first dipping, the dips having no effect on the eggs.

Lambing. Lambing on a Western sheep ranch is a strenuous time for the sheep, the owner, and his employees. As a rule a majority of the ewes are bred ("bucked up") to bring their lambs early in spring, generally between April 15 and May 30, the gestation period being 5 months. Of late, however, a great many owners are planning to have their lambs come much earlier, the lambing being done under sheds and the ewes fed hay and some grain during the critical time. This naturally makes for a larger percentage of lambs and also saves the life of many an old ewe that would never have stood the ordeal on the open range. Many owners, especially in the Northwest, erect large tents right on the lambing grounds and install sheet iron stoves in them. Then if the weather is at all threatening every ewe that shows signs of lambing within the next 24 hours is cut out from the main herd and placed in the tent where men are ready night and day to assist her and the new arrival in every possible way. Some owners provide small umbrella-like tents each large enough to cover a single ewe and her lamb; when the ewe is too close to pregnancy to be driven to camp, the camp tender sets up one of these little covers out on the range and carefully works her into it where she is reasonably comfortable during the night and protected from wild animals. Twenty-five years ago such methods would have been laughed at or considered entirely too expensive and troublesome but in 1917, with fall lambs bringing all the way from \$5 to \$10 each and ewes valued at even more, such practices pay mighty good returns on the investment.

Lambing grounds. Suitable lambing grounds are one of the prime requisites for a well planned sheep ranch. They should have plenty of water handy, shelter must be close, and the land reasonably smooth and free from badger and prairie dog holes. The feed should be such as comes very early in the spring and lambing grounds should be as far as possible protected from all other forms of grazing in order to give them every chance to reseed and keep in the best condition for this one particular use.

The ewe and her lamb. For the first 2 or 3 days after the lambs come the mothers are moved as little as possible, for of all crazy, excitable things a young ewe with her first lamb is about the worst. Her only means of recognizing her baby is her nose, and if her own lamb dies a careful herder will skin it and deftly sew the pelt on to some motherless lamb which the bereaved ewe, following only her sense of smell, generally accepts without hesitation. Naturally every

effort is made to save as many lambs as possible. Where a ewe with twins is inclined to mother but one, the other is "grafted" on to some ewe that has lost her own. This is done in many ways. Sometimes a hole is dug, the ewe and lamb are placed in it and the hole is covered with a sheep pelt, blanket or board. There in the dark the hungry little one works away until either the ewe gives up and allows it to suckle, or the lamb gets the necessary odor from close contact with her body and she accepts it as her own. A small stake pen may be used, just large enough to hold the ewe closely. Into this the two are placed, the lamb instinctively fighting away at the woolly object before it until finally accepted as a permanent boarder. Where cows' milk is obtainable many a lamb is raised on the bottle. One method is to take a large galvanized iron tub, fasten a row of small metal spouts all around it on the outside, and over each slip a rubber nipple. When the tub is filled with warm milk very little training is needed to give a bunch of hungry orphan lambs a good start in life.

Protection. Sheep men adopt all sorts of plans to keep wild animals, especially coyotes, away from the lambing grounds. At night huge fires are kept burning or boys are employed to fire shot guns or rifles loaded with blank charges at regular intervals. Better still are ordinary Fourth of July fireworks—bombs, giant crackers and even Roman candles and sky rockets. There is now on the market a gun provided with a time attachment, the magazine of which is loaded with blank cartridges which are fired at intervals all night long. Many sheepmen swing red lanterns from stakes or bushes at night and during the day keep long streamers of every possible hue fluttering in the air. These protect from eagles as well as animals.

"Marking up." A month after they are born the lambs are docked, castrated, and ear marked. This is called "marking up" and the seemingly severe process is followed by comparatively few losses, most of them following docking. For identification purposes ewe lambs are given one mark and wethers the opposite. That is, if the right ear of ewes is a "swallow fork" that mark will be put in the left ear of wethers. Between birth and marking up time there is an average loss of about 10 per cent of the lambs born so that the number of marked up lambs represents practically the season's lamb crop.

As the ewes are "bucked up" to drop their lambs a few each day instead of all at once, the lambing season generally lasts from 4 to 6 weeks. At the end of the marking up work the lambs are fully able to take care of themselves and the bands are made up for the summer ranges. One man can handle from 1,200 to 1,500 ewes and their lambs in one band under ordinary conditions.

Marketing. The raising of aged wethers has almost become extinct. Formerly mutton sheep were never sold before at least 2 years of age. Several years ago, however, the Western sheepmen turned their attention more to the mutton end of their flocks and it was soon seen that the American public was ready to accept lamb if up to the standard requirements. To-day probably 90 per cent of each year's lamb crop goes direct from the Western mountain ranges to market and the block without further feeding. Only lambs to take the place of the old ewes turned off are retained by the owners. For several years

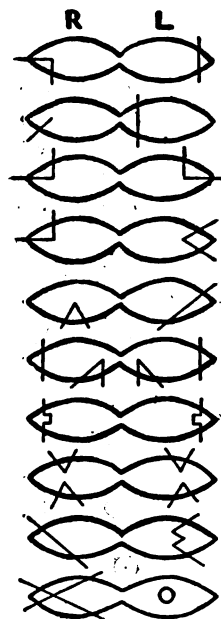


FIG. 104. Some range ear marks. From above: Crop left, under half crop right; grub left, under hack right; over half crop each; swallow fork left; underslope left, under bit right; crop and under bit each; crop and mortise each; over and under bit each; saw tooth left, under slope right; hole left, sharp right.

past the sheepmen of Idaho have been the first on the Eastern markets with their range raised lambs weighing from 70 to as high as 80 pounds with a bloom and finish not excelled by the very best hot house lambs produced. The desert ranges of southern Arizona also furnish a large number of lambs in the early spring, born in February, and grown on the finest lamb feed known, namely, the "alfileria" and "geranium" that like a carpet covers the deserts in that state in the early spring. To raise this grade of lambs sheepmen have bred their ewes to rams of the famous mutton breeds—Lincolns, Oxfords, and other "Down" varieties of coarse-wooled sheep, using only enough Merino blood to keep alive the herding instinct already mentioned.

Range Losses

The sheep owner suffers a variety of losses; some are inevitable, some can be reduced, and others are wholly unnecessary. The toll taken by preying animals is heavy. The coyote—his worst and most active enemy—is forever skulking about sheep camps and



FIG. 105. The sheep ranger's worst enemy, the coyote—but this one is in a trap

herds playing a "watchful waiting" game and seldom losing out on it. Bob cats, too, prey on the sheep though they are less numerous and more easily killed than coyotes. Frequently a bear blundering along through the underbrush or timber suddenly appears right amid the peacefully grazing sheep. Instantly they are off on a wild, senseless stampede in which they often rush pell mell into some deep wash or cut, piling on top of each other until it is filled with dead or maimed animals. Nearly 200 dead animals have been dragged from such places by the herders after such a stampede. Sometimes Bruin will come prowling about a camp at night when the sheep are all corralled and resting quietly. Poking his sharp nose between the corral poles he gives one loud sniff and in a second every animal is on its feet and tearing headlong across the corral where the whole bunch piles up, sometimes five or six deep, many being smothered to death and others suffering broken legs.

Poisonous plants. Poisonous plants cost

Western sheepmen immense sums every year. Probably the most serious losses are caused by Lupine of which sheep are very fond and which they eat without danger up to the time the seed pods begin to ripen and dry. Death camas is another dangerous plant, its leaves—very like those of several native grasses—making it difficult for herders to recognize. Fortunately death camas is rather sparsely distributed on the Western ranges and is more common in the Northwest than elsewhere. The common choke cherry also causes heavy losses. Thousands of sheep have died from eating such plants when, after a long rail shipment, they have been unloaded at some railway station where the feed is naturally scarce. The hungry animals will then eat almost anything that will fill them up and plants that are ordinarily untouched or which if grazed in small amounts will cause little or no damage, become extremely dangerous. In the National Forests the rangers post warning signs on all areas on which plants dangerous to stock are found in such amounts as to make them a menace. Despite these efforts, the annual losses among sheep from poisonous plants reach into very large figures, although they have been greatly reduced in recent years.

Diseases. Range sheep suffer but little from disease. Scab, once prevalent every-

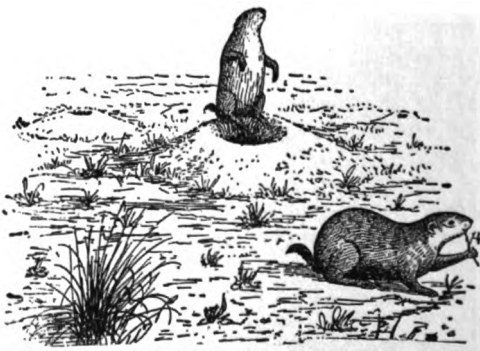


FIG. 106. Prairie dog burrows often trap young lambs if the herder is not always "on the job"

where, has as stated been almost completely stamped out, although it will always require watching. Lip-and-leg ulceration gained a slight foothold a few years ago on some of the Northwestern ranges but was quickly brought under control by Federal quarantines. Gid, bighead, staggers, and several minor

troubles that cause slight losses in range herds cannot be called diseases in any sense of the word and are not communicable or contagious. Of parasitic trouble such as intestinal and fluke worms, etc., that attack sheep raised on Eastern farms, the Western sheep raiser knows absolutely nothing.

The Range Sheep Business for Beginners

As late as 20 years ago it was comparatively easy for a young man to obtain a start in the range sheep business with little capital beyond his individual standing and willingness to work. Large owners were always ready to stake, with a band of sheep, any young fellow who had made good about their ranches. Ranches were easily found and of range there was sufficient for all. To-day it is almost impossible for a new man to get a start unless he can raise funds with which to buy out some established sheep grower.

In the last few years the Forest Service has helped the small farmers near the forests to get into the sheep business by allowing them to start in with small numbers, say from 100 to 200 head. Then the forest regulations allow several owners to combine and form a coöperative herd and thus make up one band of a size that can be handled economically. In this way these small owners get the use of the forest ranges at the lowest possible herding costs and in the fall either each brings in his part of the herd to be fed on his farm during the winter, or the herd goes to the winter ranges under the same management as during the summer. It is an interesting side light on this business to know that throughout the West sheep grazed on national forest ranges command a premium of from \$1 to \$5 per head over other sheep merely for the sake of the forest grazing privileges that are transferred with the animals.

Briefly then, to get started in the range sheep business to-day requires a minimum capital of from \$8 to \$10 per sheep which covers roughly the whole investment in sheep, rams, land, and equipment.

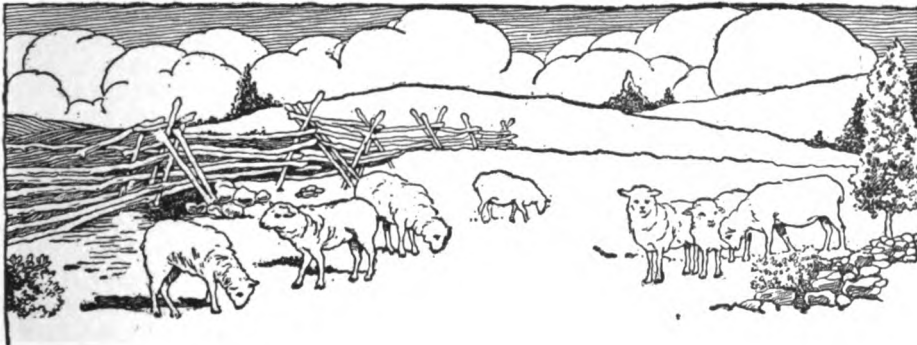




FIG. 107. Of the six world centres of sheep production which show black in this map, four—South America, South Africa, Australia, and New Zealand—are in new and sparsely settled countries (1916 Yearbook, U. S. Department of Agriculture).

CHAPTER 11

Types and Breeds of Sheep—United States Sheep Industry Statistics

THE sheep has always been and is, first of all, a range animal. To prove this we have only to note its hardiness and the density and amount of its body covering (both of which indicate also its origin in, and adaptation to, cold climates and high elevations), its excellent grazing qualities, and the tendency, in some breeds at least, to range in large flocks with little or no separation or scattering. Other or related habits or characteristics of the sheep which the shepherd should know and can take advantage of, are: (1) its desire for the higher parts of range, field, or pen, especially at night; (2) its readiness to follow a leader or the general trend of the flock; (3) its curiosity and interest in what it does not understand; (4) its preference for domestic life over a wild existence—that is, the habit of always returning, if possible, to its fold; (5) its close, even eating of turf; (6) its ability to get along with little water; and (7) its preference for running water to a supply from still pools or troughs.

How sheep raising developed. The raising and grazing of sheep on extensive ranges, usually of average or low value, and the use of its wool, are, therefore, the lines along which man has longest made use of them. The natural body covering of the sheep is a coarse hair, represented by the "kemp" in animals of poor quality or those raised under very unfavorable conditions. The modern fleece is the result of care, breeding, and selection on the part of many generations of men, just like the present milk yields of cows.

Gradually, however, man began to appreciate the sheep also as a source of meat, either in combination with wool production or as a specialty. This brought about 3 things: (1) the development of the strictly mutton type as contrasted

with the specialized wool type; (2) the development of the combination "medium wool" and "medium to good mutton" type; and (3) the raising of sheep on smaller areas of better, more valuable land than the ranges. To-day in many sections and many countries, sheep are raised: (1) under range conditions, in very large flocks; (2) on rough, otherwise useless tracts of small general farms, in very small flocks; or (3) on rich arable land on farms of medium size, in small to medium sized flocks which represent an important source of the farm income. Under the second of these conditions sheep make poor land return some profit, and furnish both wool and meat for home use or the general market.

Advantages that largely determine the great value of sheep from the farm standpoint are: (1) They multiply and mature more rapidly and produce more in proportion to what they consume than cattle. This fact is modified but not offset by their more limited capacity for coarse roughage. (2) They are especially fitted to graze green forage crops and grain stubble. (3) They maintain fertility by distributing manure more evenly than other stock, especially over highest parts of fields and pastures which are the hardest to fertilize by any other method. (4) They eat a larger proportion of weeds than any class of farm animal except goats and thus tend to keep pastures cleaner. (5) Of their products, the meat can be capitalized quickly, and the wool (harvested at a different season) can either be marketed at once or easily stored without loss of quality or value. In short, sheep offer great inducements to any farmer equipped to handle any sort of live stock either intensively or extensively.

Types of Sheep

As already noted there are 3 classes of sheep—the wool, the mutton, and the combination or general purpose—including a score or more of distinct breeds which may also be grouped in several other ways according to characteristics listed in the table on page 116, such as size, quality of wool, color of face, range as to altitude, etc. As far as their use is concerned, these breeds overlap more or less and, in breeding for certain ideals or to meet certain conditions, they are often combined and interbred. In a very general way the wool and mutton types of sheep can be compared with the dairy and beef types of cattle; in the former a spare frame and active body are mainly directed toward the growth of a heavy, dense fleece; in the latter a smooth, blocky, well fleshed carcass of good quality and quick maturity is the goal.

AVERAGE WEIGHTS OF IMPORTANT BREEDS OF SHEEP AT DIFFERENT AGES
(COMPILED BY WM. HYSLOP, ANIMAL HUSBANDMAN, WASHINGTON EXPERIMENT STATION)

BREED	SEX	6 MONTHS	1 YEAR	2 YEARS AND OVER
Hampshire.	Ram	90 lbs.	175 lbs.	250 lbs.
	Ewe	80 "	140 "	190 "
Lincoln.	Ram	95 "	180 "	250 "
	Ewe	85 "	150 "	200 "
Rambouillet	Ram	75 "	130 "	185 "
	Ewe	70 "	125 "	150 "
Shropshire.	Ram	80 "	160 "	220 "
	Ewe	75 "	130 "	160 "
Southdown	Ram	60 "	120 "	175 "
	Ewe	65 "	100 "	135 "

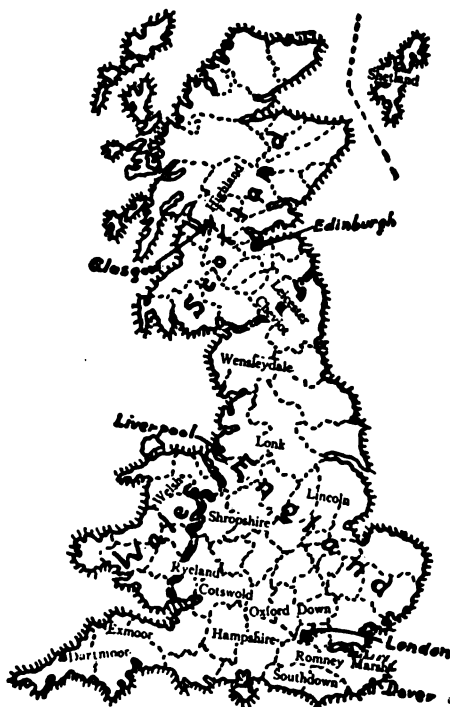


FIG. 108. Map of the British Isles, showing where the important English and Scotch breeds of sheep originated

A classification, especially valuable because it throws light on the historical development of the types, gives two groups: the fine and the coarse woolled. The first includes only the Merino in its different forms (including the Rambouillet). The original home of sheep was probably central Asia; from here the spread of civilization carried them in two directions, through southern Europe into Spain, and through northern and central Europe into England. The Spanish branch received the addition of blood from breeds of northern Africa and eventually gave rise to the highest type of fine wools. In developing them in this direction Spain long held the supremacy of the world; France, Saxony (in Germany), Australia, and America have carried on the work. The English branch received none of this African blood and only very gradually was developed along mutton-producing lines to meet conditions found on English farms. All the resulting English breeds bear wool that is coarse compared with the Merino type. In some cases, however, the fleece, whether long and loose or short and compact, is much more valuable than the mutton; in other

cases the reverse is true; in others, both fleece and meat have a real value. Thus we arrive at the 3 groups or types mentioned in the beginning of this chapter. The so-called "Down breeds" include several of the English or coarse woolled type which have been developed in various parts of the island but under similar conditions of soil, climate, and elevation. The "downs" are gently rolling plains ranging from 400 to 1,000 feet above sea level and have proved especially well adapted to the raising and improving of sheep.

Modern sheep husbandry then owes its supply of breeds first, to Asia where the animals were originally domesticated and whence have recently come a few breeds with special characteristics and adaptations; second, to Spain and the region bordering the eastern part of the Mediterranean Sea; and third, to Great Britain, its climate, its soils, and its creative breeders.

Breeds of Sheep

Barbados or "woolless." A small, deer- or goat-like, very hardy, prolific breed probably native to Africa but introduced into America from the Island of Barbados in the West Indies. The mutton conformation is

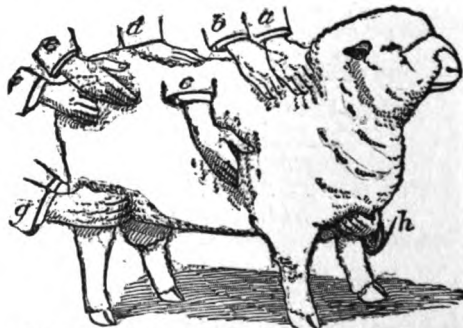


FIG. 109. What to look for in a good sheep: a neck development; b fullness through shoulders; c lower chest and flank development; d covering and firmness of loin; e width and thickness of loin; f hindquarter development; g leg of mutton development; h depth through chest.

very poor and the wool so short that it does not show through the hair, which ranges from $\frac{1}{2}$ inch to 2 inches in length, except from the lower jaw down over the brisket of rams where it is long and coarse. The ewes breed at any season and produce twins and triplets more commonly than single lambs. They are excellent milkers, yielding very rich milk. If these characteristics can be introduced without causing inferiority in other directions, this breed should prove valuable for crossing.

Black Faced Highland. A very hardy, horned breed developed among the Scotch Highlands and adapted to localities marked by a severe climate and rough, scant, poor pastures. Its head is black or black and white. Its short body conforms to the mutton type but its home environment prevents extreme development in this direction; animals raised there are usually shipped to better farming sections to be brought to market condition. The wool is long, but coarse, loose, "kempy" and generally inferior to that of the other "long wool" breeds; it is mostly used for carpets and coarse cloth making. Highland sheep are rare in this country but as mutton producers under unfavorable conditions would prove excellent.

Black Faced Highland Sheep Association, Mesa, Ariz.

Cheviot. A breed from the broken, moderately high range of hills of the same name, lying partly in Scotland and partly in England; well able to stand changeable upland conditions but not as hardy as the Black Faced Highland. The body is longer than in the Highland, of about the same weight as the Shropshire, very strong in the back, sometimes rather light in front. The head is short, broad, white with black nostrils, and bare, except for short, hard hair. The wool which stops abruptly behind the erect, active ears is long, of medium quality, rather open and lacking in yolk. As a rustler and a source of excellent mutton even on grass alone it offers fine possibilities, but it is not widely popular outside of Great Britain, perhaps because of the tendency of flocks to scatter. The general



FIG. 111. A Black Faced Highland sheep

form of the body and head, compactness of the wool, and active, lively appearance and temperament distinguish it from all other sheep.

American Cheviot Sheep Society, Fayetteville, N. Y.

Corriedale. A breed developed in New Zealand by interbreeding and selecting the offspring of crosses between Lincoln and Leicester rams and Merino ewes. It is now well established, breeds quite true to type, and produces a high grade fleece and a fair carcass. Importations recently brought to this country are being carefully watched in the hope that there may be found in the Corriedale an animal as well adapted to range conditions as the Merino and superior to it in size of carcass and quality of mutton.

Cotswold. One of the large, long (and loose) wool breeds of southwest England, inhabiting there a rolling, well drained country at an elevation of about 600 feet. The Leicester was probably used to improve its original quality. The long open fleece hangs in ringlets, parts along the back even down on to the forelock and ranges from about 12 to sometimes 20 pounds in weight. The frame is large, but the rate of growth is rather slow, the mutton is inferior to that of smaller breeds and there is often too much fat on the back and around the tail, which may affect the breeding qualities. As vigorous, active grazers, good milkers, and mothers and heavy shearers of a strong but coarse fleece, Cotswolds have won considerable popularity. They are also valuable for crossing to increase size and weight of fleece where a slight increase in openness is not harmful. Where meat production is emphasized, smaller types are generally preferred.

American Cotswold Registry Association, Waukesha, Wis.

Dartmoor. A long-wooled sheep from Devonshire in England, where it withstands a wet climate without shelter and thrives without feed other than grass. The fleece is long, sometimes exceeding 15 inches for 12 months' growth, excellent in quality, and strong. In many respects this breed closely resembles the Cotswold, but it is characteristically ewe-necked and the fleece extends farther down the legs. The breed is little known and unimportant in the United States.

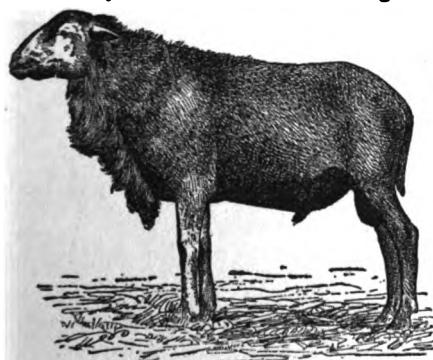


FIG. 110. A Barbados ram

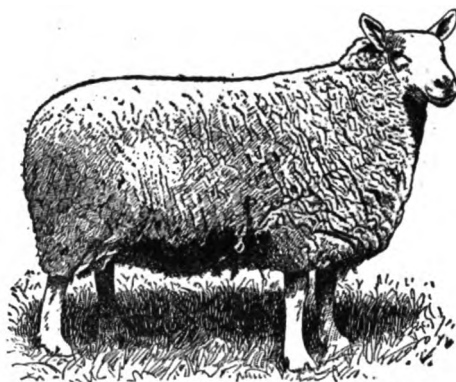


FIG. 112. A typical outstanding Cheviot

Dorset Horn. A rather small, all white breed, characterized by the large, curling horns of both ram and ewe, that comes from southern England, where it has long been known as the only horned sheep with white face and legs. The fleece is short, of medium quality, and often scant on the under side of the body. As a producer of mature mutton the Dorset does not rank high but as a source of spring and winter ("hot house") lambs it is unsurpassed. Dorset rams on cross bred Dorset-Merino ewes produce lambs that fatten easily, are very blocky and if well finished almost always top the market. The fact that Dorset ewes mature very early and can be bred twice a year, frequently producing twins and sometimes triplets, adds to their value for this purpose.

Continental Dorset Club.

Dorset Horn Breeders' Association of America, Washington, Pa.

Exmoor Horn. An English breed, somewhat resembling the Southdown in conformation and easy fattening qualities, but of larger size and with longer and much superior fleece. Both rams and ewes have horns and the rams are bearded like goats. In England the breed is much admired for symmetry, and the quality of its wool and mutton; in the United States it is almost unknown.

Hampshire Down. This, the second largest of the Down breeds (being exceeded in size only by the Oxford) was developed in south central England and has recently met with a wave of popular favor in the United States. The most striking Hampshire characteristics are the black head, ears and legs, and the large, pointed ears setting out at right angles from the head; the forehead and cheeks are well covered with wool. The fleece is dense and of moderate length but lacks the quality and weight of Southdown and Shropshire fleeces, 8 pounds being a generous average. Hampshire lambs are large at birth and grow rapidly, but old sheep tend to coarseness of bone and flesh. Early maturity, size, and a

vigorous constitution make the Hampshire valuable for crossing on ewes with plenty of quality for the production of large, early lambs. As a grazer and forager it is said to be unsatisfactory, but for full feeding in a fold, or generous grain feeding in connection with the grazing of cultivated green crops, it gives better results than any other Down breed.

Hampshire Down Breeders' Association, Nottawa, Mich.

Herdwick. A small, white faced, short, and medium fine wool breed of which only the males are horned, developed in the mountainous lake region of northwest England, but little known elsewhere. As a breed of hardy rustlers and foragers it ranks with the Highland Black Face, from which it may have sprung.

Karakule or Arabi. A breed from Turkestan in Asia, where it has been and is the sole source of the popular lustrous, black, tightly curled "fur" known as "Persian lamb." The pelts are obtained from lambs under 10 days old; after this age the curls loosen and the value of the skin decreases. Formerly the skins of unborn lambs were used but this practice, which involved the killing of the ewe as well, is being discontinued. Although the exportation of these sheep is now prohibited, a number had been brought to this country before this ruling went through and the possibilities of the Persian lamb industry will undoubtedly result in a continued increase in their numbers and popularity. Various crosses have been tried to strengthen the weak points of the breed. The use of the Barbados sheep (p. 113) promises good results in increased fertility though the first cross is unsatisfactory from the fur standpoint. The Karakule is very hardy and its mutton is said to be excellent. The breed is one of several in which the tail is large and flattened and serves as a storehouse for fat against times when food is scarce. Under domestication in this country danger of famine is removed and it is probable that succeeding generations will show smaller and smaller tails.

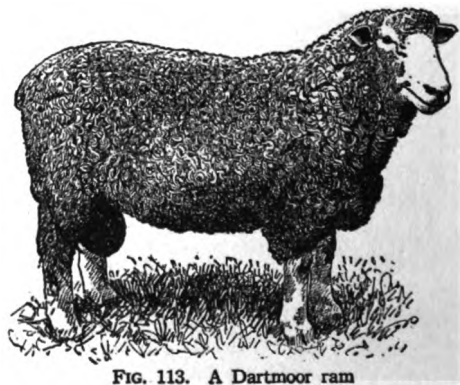


FIG. 113. A Dartmoor ram

Kerry Hill. A Welsh breed of comparatively recent origin, little known except in a limited region on the border between England and Wales. The breed is characterized mainly by the mottled face and the fine quality, medium weight fleece.

Leicester (pronounced Lester). The second of the large, English, lowland breeds, the others being the Cotswold (p. 113) and Lincoln (see below). In England there are two types—the true Leicester developed by the famous breeder Robert Blakewell in central England, and the Border type perfected on the border line between England and Scotland; in America little or no distinction is made between them. Though smaller than the other lowland and long wool breeds, the Leicester is a large, quick maturing sheep; it is not a good grazer, but does well where abundant feed is easily available, and in various parts of England as well as in other countries it is much used in crossing to produce size, easy fattening qualities and early maturity in grade lambs. It is long in body and legs, carries its body and head almost on a line, and has less wool on the face than the Cotswold. The fleece is finer in fibre than that of any other long wool sheep, averages about 12 pounds in weight, is loose but evenly curled, sheds rain better than the shorter, tighter types, and tends to be thin under the belly. Associated with its large size, the Leicester shows a quiet disposition and a tendency to put on rather soft flesh and considerable fat.

American Leicester Breeders' Association, Cameron, Ill.

Lincoln. A long wool breed of the "lowland" type from east England, the largest of all sheep. It also produces the longest staple, fleeces 21 inches long and 32 pounds in weight having been recorded; a growth of 8 inches a year is required for the registry of any animal. Like the Cotswold and Leicester of the same type, it is not highly valued as a source of mature mutton, being too large, coarse of flesh and likely to be too fat. Its lambs are good



FIG. 115. A Karakule ewe and its lamb showing the "Persian lamb" fleece

feeders and fatten rapidly; its breeding qualities are good; its wool, in addition to being long, is very lustrous though coarse; and for crossing it offers generous possibilities. Because of our hot, dry summers for which it is unfitted by size and temperament, it is less important in this country than in New Zealand, Australia, and Argentina.

National Lincoln Sheep Breeders' Association, Charlotte, Mich.

Lonk. A horned breed native to Lancashire, England, with black-and-white spotted face and legs, and a medium weight fleece of long, loose open wool. It is well suited to mountainous sections, but, lacking the close, flocking instinct desirable on the range, it has never become popular in this country.

Merino. This name, broadly applied, covers all existing fine wool sheep. The characteristics of the type, other than those relating to the fleece, are: (1) a small, compact body, almost totally lacking in mutton qualities; (2) hardness; (3) an active, alert temperament; (4) fine grazing qualities; (5) a remarkably strong flocking instinct that is always transmitted even with the smallest percentage of Merino blood; and (6) a loose, elastic skin which forms rolls or folds and thus materially increases the wool producing surface and the weight of the fleece. The various groups, strains, or types of fine wool sheep are:

1. *The Spanish Merino* or foundation stock developed in the mountains of Spain from animals brought from the Far East by the Romans and combined with blood from northern Africa. From almost the beginning of the Christian era up to the nineteenth century Spain led all other countries in wool production. The practice of herding the flocks in the south over winter and driving them north for summer pasture resembled modern range practices and served to fix in the breed the adaptability to range conditions that has since made it so valuable throughout the world.



FIG. 114. A Leicester sheep of the right type

NAME	ORIGIN (ALTITUDE)	PURPOSE	SIZE AVERAGE WEIGHTS RAM—EWE	HEAD CHARACTER	WOOL	STAPLE	GENERAL CHARACTERISTICS
Barbados*	North Africa	Crossing to increase fertility	Small 135—90	Polled; dark face			Small size; absence of wool; great fecundity
Black Faced Highland*	Scotland (Upland)	Wool	Small 150—125	Horned; black face	Coarse	Long	Strong constitution, good forag- ing qualities
Cheviot*	England (Upland)	General purpose	Medium 200—150	Polled; white face	Med.	Short	Active appearance; alert expres- sion; good grazing qualities
Corriedale*	New Zealand (Midland)	General purpose	Medium 200—150	Polled; gray face	Med.	Med.	Good mutton type and fine fleece combined; same flocking habit as Merino
Cotswold	England (Lowland)	General purpose	Large 260—210	Polled; white face	Coarse	Long	Long, open fleece hanging in ringlets; curled forelock cover- ing eyes
Dartmoor*	England (Upland)	General purpose	Large 235—185	Polled; white face	Coarse	Long	Resembles Cotswold but has more wool on legs; strong con- stitution
Dorset Horn	England (Midland)	General purpose	Medium 225—165	Horned; white face	Med.	Short	Great fecundity (often lambs twice yearly); importance in "hot-house lamb" production
Exmoor*	England (Upland)	General purpose	Medium 185—140	Horned; brown face	Med.	Med.	Resembles Southdown but is larger and has longer fleece; rams bearded
Hampshire	England (Midland)	Mutton	Large 275—200	Polled; black face	Med.	Short	Ears at right angles to head; early maturity; large size
Herdwick*	England (Upland)	Wool	Small 150—125	Rams horned; white face	Med.	Short	Small size; hardness; good rustl- ing qualities
Karakule	Western Asia (Upland)	General purpose	Small 150—120	Rams horned, black face	Coarse	Long	Fat tail; short, tightly curled, glossy, black fleece of new born lamb
Kerry Hill*	Wales (Upland)	General purpose	Medium 200—150	Polled; mottled face	Med.	Med.	Fine quality fleece; black and white face
Leicester	England (Lowland)	General purpose	Large 250—200	Polled; bald white face	Coarse	Long	Large size; bald, low carried head; early maturity
Lincoln	England (Lowland)	Wool	Large 300—260	Polled; white face	Coarse	Long	Large size; long fleece; fat mut- ton, large bone
Lonk*	England (Lowland)	General purpose	Medium 200—160	Horned, mottled face	Med.	Med.	Black and white face
Merino	Spain (Upland)	Wool	Medium to small 200—150 130—100	Ram horned; dark face	Fine	Short	Skin in loose rolls; oily fleece of <i>fine</i> wool; strong flocking in- stinct; poor mutton form
Oxford Down	England (Midland)	Mutton	Large 280—200	Polled; white face	Med.	Med.	Large size (largest of Downs); fine mutton form; poor forag- ing qualities
Persian*	Persia (Upland)	General purpose	Small 150—120	Polled; dark face	Coarse	Long	Fat tail; arched back; hanging ears; Roman nose
Rambouillet	France (Midland)	General purpose or wool	Medium 200—155	Ram horned; dark face	Fine	Short	Blending of wool and mutton types; lighter color and drier, lighter fleece than Merinos
Romney Marsh*	England (Lowland)	General purpose	Large 225—185	Polled; white face	Coarse	Long	Large size; fleece denser and mutton qualities better than other long-wools
Ryeland*	England (Midland)	General purpose	Medium 225—175	Polled; dark face	Med.	Med.	Early maturity; fecundity; graz- ing qualities
Shetland*	Shetland Islands (Upland)	Wool	Very small 40—30	Ram horned; brown face	Coarse	Short	Small size; active, wild nature; wool concealed by hair
Shropshire	England (Midland)	General purpose	Medium 225—160	Polled; dark brown face	Med.	Med.	Good mutton type and fleece; wide adaptability; good feed- ing qualities
Southdown	England (Midland)	Mutton	Medium 175—135	Polled; brown face	Med.	Med.	Low "blocky" body; fine mutton conformation; early maturity.
Suffolk	England (Midland)	Mutton	Large 240—175	Polled; black head	Med.	Short	Early maturity; high dressing percentage
Tunis	North Africa (Midland)	Mutton	Small 150—120	Polled; brown face	Med.	Med.	Fat tail; fair fleece and mutton; hardness; grazing qualities; fecundity; immunity to sheep bots
Welsh*	Wales (Upland)	General purpose	Small 150—125	Ram horned; bald white face	Med.	Med.	Small size; excellent fleece
Wensleydale*	England (Lowland)	General purpose	Large 235—185	Polled; white face	Coarse	Long	Long, lustrous, wavy, closely curled fleece; resembles Lei- cester, but is more active and upstanding

*Indicates breeds relatively unimportant in the United States.
Under Origin.—Lowland includes country from sea level to 1,000 feet; Midland from 1,000 to 2,500 feet (including the Downs); and Upland from 2,500 to 4,000 feet or more.

II. *The Saxony Merino.* About 1765 Spanish stock was taken to the state of Saxony in Germany and under careful, skilful handling produced a larger, heavier race that has won considerable popularity in Europe.

III. *The French Merino.* Between 1780 and 1900 the French Government also imported Spanish Merinos and set out to develop a new type along the lines set by Saxony. There resulted the Rambouillet, discussed below.

IV. *The American Merino.* Merinos began to come to this country about 1801, first from Spain and later from Saxony. Here, especially in Ohio and New York, the types were crossed, re-crossed, and improved to meet our particular conditions until the American fine wool type became fixed and distinct. This now includes three classes, each showing to some extent the characteristics given for the Merino type above, and each highly valued by representative breeders.

Class A represents the extreme wool-producing type. The skin is wrinkled or folded over the entire body; the fleece carries an abundant yolk and is denser and finer, though perhaps a little shorter, than in either of the other groups.

Class B shows a medium amount of skin folding and a fleece lighter in proportion to the body weight but longer in staple. Probably the majority of fine wool-producing sheep in the country approach most closely to this type. The smaller number of folds makes shearing much easier.

Class C or the Delsaine Merino carries no skin folds or at most a few on the neck. Its wool is fine but of longer fibre than that of Classes A or B; its body exhibits some mutton characteristics and enough size to make the type important as a meat producer for range conditions.

These three classes though bred separately are often mixed in order to maintain a balance of desirable qualities. That the American Merino is established and recognized is shown by the readiness with which it has been used in Australia and Africa on an equal footing with the older Spanish and French types.

Oxford Down. The largest and heaviest of the Down breeds, and the one that yields the heaviest fleece. It originated in central England as the result of crossing Cotswold rams on Hampshire and Southdown ewes. It is of excellent mutton form, and though not active enough to be a first class forager, it makes rapid gains and good quality when generously and carefully fed. It also has considerable power to stamp these characteristics on offspring of Merino or common ewes bred to it, and is being widely distributed and favorably reported. The wool ranges from 4 to 5 inches long and is fairly fine; the fleece averages around 10 pounds in weight. Breeding qualities are good and a slight lack of uniformity in results of crossing is being

corrected as the breed type becomes more firmly fixed.

American Oxford Down Record Association, Hamilton, O.

Persian. Another of the "fat-tailed" breeds; of no commercial importance in this country. Due to a misunderstanding it was at one time considered the source of the astrachan lamb skins, hence the common trade name of "Persian lamb."

Rambouillet. The French Merino resulting from the development of Spanish Merino stock in France; the name is taken from the location of the farm on which the work was begun. As compared with the original type, the Rambouillet is larger, more robust, heavier in frame and bone, more



FIG. 116. An Oxford Down ram

"growthy," more prolific, of earlier maturity, with distinct mutton qualities and a smooth or very slightly wrinkled skin; the fleece is more uniform, somewhat coarser, and contains less yolk. Though inferior to the mutton breeds for meat production, it easily excels them in weight and quality of fleece, and because of its size, typical Merino flocking instinct, and the mutton conformation it possesses, it is very popular on Western ranches.

American Rambouillet Sheep Breeders' Association, Milford Centre, O.

International von Homeyer Rambouillet Club, Hamburg, Mich.

Romney Marsh or Kent. Next to the Lincoln this is the largest of all sheep. It belongs to southeast England where it was developed to meet conditions that involved heavy, intensive feeding on low-lying, level land. It is not a popular breed on the general farm or in hilly regions where foraging is necessary. The fleece is long and dense but the scarcity of ringlets makes it resemble that of the medium wool rather than those of the other long wool breeds. Its mutton qualities are superior to those of any other long wool breed and have resulted in the Romney's tak-

ing an important place in the frozen carcass export trade of Argentina, Australia, and New Zealand. The breed is little known in the United States and would probably find a place only where generous feeding on restricted areas of low land can be practised.

American Romney Breeders' Association, Ames, Iowa.

Ryeland. An old breed native to the mid-land counties of England, formerly of considerable importance and now again increasing in popularity. It was first imported into America in 1907 and is therefore little known here. It is of good size, hardy, thrives on scanty pasture, bears a fleece of excellent quality of about the same weight as that of the Oxford, is prolific, with fine milking qualities, and produces very fat lambs that grow and mature rapidly. In type it resembles a combination of Shropshire and Southdown, with both of which it has been crossed with good results.

Shetland. A small, deer-like breed, white, black or brown, weighing only 30 to 40 pounds at maturity, and native to the Shetland Islands northeast of Scotland. The sheep are hardy, produce excellent mutton and wonderfully fine wool, which is not shorn but "plucked" by hand each spring when it loosens from the body and rises up through the hair which at other times of the year covers it. The wool is used for making the famous and popular Shetland shawls and Shetland or "Iceland" yarns. A very few animals have come into the United States and are slowly increasing, but on account of their small size and wildness they are suitable only for raising in parks and as ornamental features of country estates.

Shropshire. This, the most popular of all the medium-wool breeds, was developed in west-central England but is now found in large numbers in every sheep-producing region of the world. In ability to quickly adapt itself to new and varied conditions without losing quality it is unexcelled. Although its prepotency and fertility have earned it a place on the range, and its early maturity a place in the feedlot, it is as a general purpose or "farmer's" sheep on the general farm that it

has won greatest honors and popularity. It offers an almost perfect combination of ample size, excellent mutton, good fleece, hardy, vigorous constitution, and good feeding qualities.

In form the Shropshire conforms closely to the ideal mutton type. The body is exceptionally deep and broad, and the excellent back is heavily covered with flesh of fine quality. The dressed carcass ranks second only to that of the Southdown and at times even excels it in quality. The compact fleece, covering evenly the entire body and head except the black-brown muzzle, nostrils and ears, is of good weight, superior fineness, and contains considerable yolk. Both in number of breeders and of animals registered in the United States, the Shropshire is far in advance of any other breed.

American Shropshire Registry Association, LaFayette, Ind.

Southdown. This, the oldest Down breed and one of the oldest of all British sheep, reached and has maintained its high degree of perfection in southeastern England on a rolling belt of limestone hills covered with short but close, nutritious pasture grasses. Skilful and farsighted breeders early developed a low, level, compact form dressing a high percentage of the highest class mutton, a fine-fibred, short, dense fleece, and a very rapid maturity to the most desirable market condition. Prepotency and the long establishment of the type have fixed these characteristics and, notwithstanding less noticeable breeding qualities the breed has taken front rank in every mutton producing country in the world. It is active, vigorous, a good grazer; indeed, too favorable conditions and overgenerous feeding tend to produce inferior flesh and weakened constitutions. It is invaluable for use on native stock when improved mutton carcasses are desired. In the United States, where the general purpose sheep is perhaps most in demand, it has hardly held its own in competition with the Shropshire, Hampshire, and Oxford. The face, ears, and legs are a gray brown—lighter than in the Shropshire, and the face is not so well covered with wool. The solid flesh and blocky form give the breed more weight than its size would indicate.

American Southdown Breeders' Association, Springfield, Ill.

Suffolk. A comparatively new breed from southeast England, little known in this country. It averages a little larger than the Shropshire and somewhat smaller than the Hampshire, but because its combination of mutton and wool qualities is less attractive than that of other Down breeds it has not aroused much interest here. The face, head, and bare legs are solid black; there is no wool forward of the poll, and the effect of a rather high standing position is increased by a tendency to short wool on the belly. In early maturity, quality of mutton, average dressing

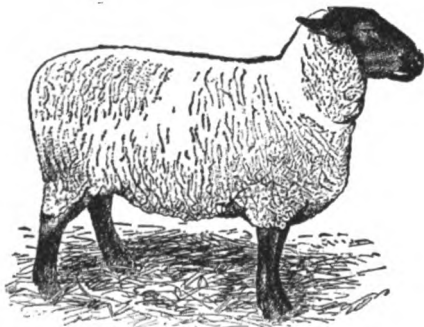


FIG. 117. The Suffolk—not well known in America

percentage of carcass, prolificacy, and the milking qualities of ewes, it is a breed of considerable merit.

American Suffolk Flock Registry, Guelph, Ont., Canada.

Tunis. A "fat-tailed" breed from northern Africa. It has been known in the United States for more than 100 years and was well represented in Virginia and the Carolinas before the Civil War and the beginning of the spread of Merino popularity. In the last 25 years interest in the breed has revived with Indiana as the new centre of activity, although Tunis blood has also been used to great advantage in the Southwest in improving the native sheep there.

The Tunis sheep is small, rangy, active, and prolific, grazes well, and readily adapts itself to a variety of climatic conditions. Ewes will breed at almost any season and produce strong, early maturing lambs suitable for "hot house" lamb production. The combination of Southdown with Tunis blood has resulted in improved carcasses and has reduced the size of the broad flat tail which improvement and care had already made much smaller than it formerly was.

American Tunis Sheep Breeders' Association, Crawfordsville, Ind.

Welsh or Welsh Mountain. These names are not restricted to a single breed but refer to several types native to Wales, the commonest and most popular being very small, usually white faced, bare of poll, and horned only in the case of the ram. The wool, of excellent

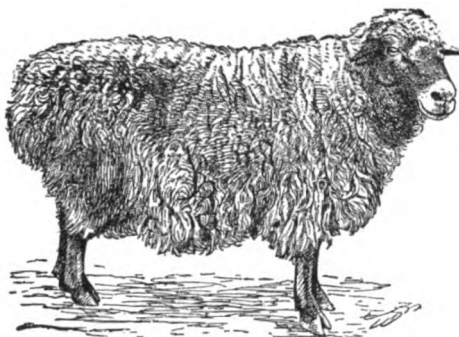


FIG. 118. A Tunis sheep of the "fat-tailed" type

quality, is made into the famous Welsh flannels, shawls, etc.; the mutton, though not an important commercial asset, shares honors with the meat of the Black Face Highland and Southdown on the London markets. The breed is practically unknown in the United States.

Wensleydale. An English breed somewhat resembling the Leicester in size and general appearance, but more active and upstanding. It is almost unknown in this country, but in England it is in considerable favor for crossing upon Black Faced Highland ewes, for the production of early maturing, dark faced lambs of excellent quality. Striking features are a lustrous, wavy, and closely curled ("pirled") fleece, and a blue tinge on the face and skin.

United States Sheep Industry Statistics

The maps on pp. 110 and 120 indicate the distribution of sheep throughout the world and the United States. With the exception of England and central south Europe, the great sheep centres are south of the equator and in new countries containing vast expanses of sparsely populated, untilled land. The relative importance of Russia and the United States are not clearly indicated because their sheep are scattered over such broad territory. The leading nations in sheep raising are:

COUNTRY	NUMBER OF SHEEP	PER CENT. OF WORLD'S TOTAL	WOOL	
			EXPORTED IN 1913 (pounds)	IMPORTED IN 1913 (pounds)
Australia	85,000,000	13+	603,271,000	.....
Russia	81,000,000	13	38,200,000	121,691
Argentina	80,000,000	13—	264,728,000	.....
United States	50,000,000	8	.....	130,183
The World	588,000,000	100	.....	.....

The total number of sheep in the United States has varied year by year but remained at about the same level since 1867; the av. value per head, however, increased from \$1.96 in 1870 to \$11.82 in 1918. In some sections, as in most countries except England, the numbers of sheep have been decreasing steadily. This is due to the fact that as the proportion and value of tilled land increases the raising of sheep for wool—rarely profitable save on cheap land—decreases, while the raising of sheep for meat does not increase in proportion.

However, the annual consumption of lamb and mutton has increased in the last 10 years from about 9½ to some 13 million animals. The annual importations of wool average about 300 million pounds; only 1 in every 7 farms of 20 acres or over raises sheep at the rate of 1 to each 3 acres of pasture; and prices for wool,

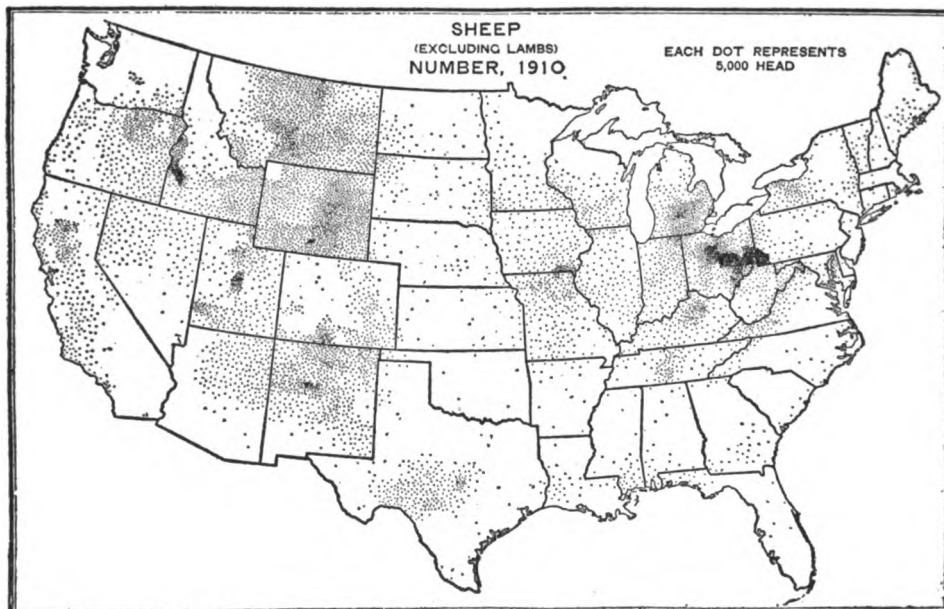


FIG. 119. There are two typical sheep regions in the United States—one in the East Central, feedlot country; the other scattered over the open range country of the West (1915 Year Book, U. S. Department of Agriculture)

meat and breeding stock are rising constantly. There are many reasons for increasing the number of sheep on farms especially in the more developed eastern and northeastern sections. Clearer appreciation of the value of sheep, better understanding of what the different breeds offer and require, and increased knowledge of how best to get maximum returns from them, should help to bring about this result and with it national if not world-wide benefit.

SHEEP IN THE UNITED STATES

YEAR	NUMBER	VALUE	AVERAGE PRICE PER HEAD
1870	40,853,000	\$ 79,876,000	\$ 1.96
1880	40,766,000	90,281,000	2.21
1890	44,336,000	100,660,000	2.27
1900	41,883,000	122,666,000	2.93
1910	52,447,861	216,080,000	4.12
1917	48,483,000	346,064,000	7.14
1918	48,603,000	574,575,000	11.82
1919	49,863,000	579,016,000	11.61

LEADING STATES IN SHEEP RAISING AND WOOL PRODUCTION

STATE	NO. OF SHEEP (JAN. 1, 1919)	AV. PRICE PER HEAD	POUNDS OF WOOL (1917 CLIPS)	AV. PRICE PER POUND (CENTS)
Wyoming	4,018,000	\$12.30	30,380,000	48
Idaho	3,234,000	12.20	15,000,000	50
New Mexico	3,135,000	8.50	18,422,000	41
Montana	2,984,000	11.80	23,842,000	46
Ohio	2,980,000	11.00	13,923,000	57
California	2,943,000	12.00	12,180,000	46
Oregon	2,497,000	12.00	13,200,000	47
Utah	2,410,000	11.00	15,600,000	42
Colorado	2,308,000	10.90	8,820,000	38
Texas	2,232,000	9.40	10,192,000	52

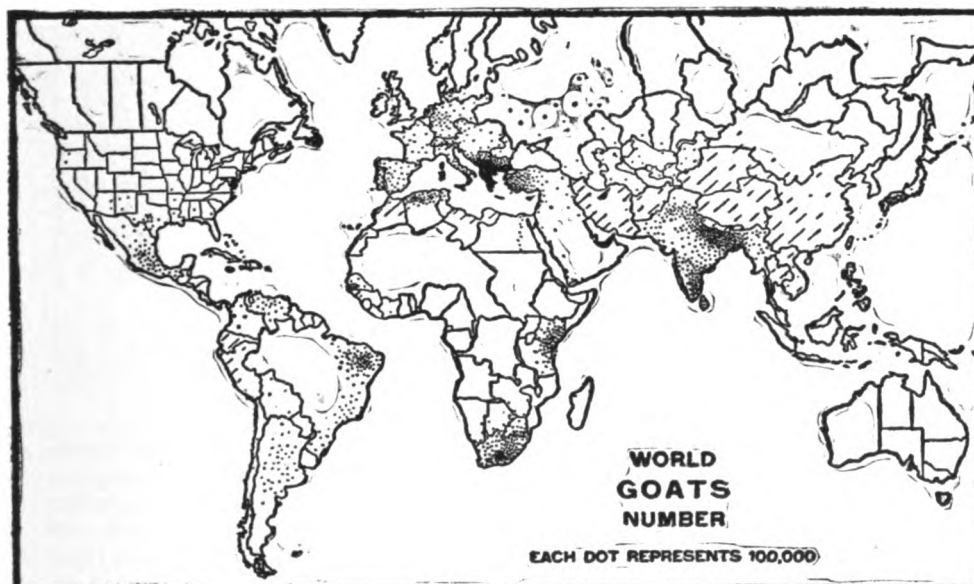


FIG. 120. Goats, like mules and asses, are associated with countries of scant vegetation and relatively poor peoples. India with nearly 29 millions has 26 per cent of the world's goats, but South Africa, Turkey, and Greece, have more per 1,000 population and per square mile of territory (1916 Yearbook, U. S. Department of Agriculture). See following Chapter.



FIG. 121. Milk goats on the Experimental Farm of the U. S. Department of Agriculture. As the result of a better understanding of their natures and needs, these little animals are being more widely raised and more generally appreciated throughout this country than they have ever been before

CHAPTER 12

Goats and Goat Raising

There are in America three types of goat—the Angora, the milk goat, and the common, short haired "domestic" sort—really an unimproved milk goat. Of the first two there are a good many registered purebreds and many more good grades; being improved species developed for special purposes, both are increasing steadily in numbers and importance, though neither is yet as common here as in some foreign countries. The common goat with no pure blood to register and no special usefulness is just as rapidly disappearing from modern farms.—EDITOR.

THE ANGORA GOAT

Prepared with the cooperation of A. C. GAGE, Editor "The Angora Journal," DR. H. D. PARKER of Portland, Oregon, and L. L. HELLER formerly of the United States Bureau of Animal Industry in which connection he carried on special investigations with sheep and goats.—EDITOR.

THE American Angora of good quality weighs from 60 to 100 pounds when full grown, is generally pure white, and has a dense, fine fleece hanging in ringlets and covering the entire body except the inside of the upper part of the legs. It is usually horned, the horns of the male or *buck* being longer, more spreading, and more twisted than those of the female or *doe*.

Where it can be raised. As far as climate is concerned, the Angora thrives anywhere in the United States if given a shelter where it can keep *dry* in time of rain and storm. No weather is too cold, and even the extreme heat of the Southwest has no bad effect. Soil conditions are more important. Goats cannot be raised on low, damp, marshy land; on the other hand, well drained upland can hardly be too rough, rocky, and scrubby to suit them. Just as good a profit, proportionately, can be obtained from a small flock kept on the waste and wooded pastures of a small farm as from thousands herded over the wide ranges of the West. Judged by numbers and size of investment, however, the Angora goat industry centres in Texas, Arizona, New Mexico, California, and Oregon. Nevertheless in 1916 the American Angora Goat Breeders' Association had members in forty-seven states.

The Management of the Angora Flock

Goats need about the same general care as sheep receive on the range or on farms where the wool is purely a by-product. That is, Angoras are rarely if ever kept under feed lot conditions and given the intensive care and feeding that specially developed mutton and show sheep often receive. The main differences in the handling of the two groups of animals are the result of differences in their habits. Sheep, for instance, are grazers and prefer to range slowly over grassy fields cropping the herbage closely and evenly. Goats, on the other hand, are "browsers," and prefer coarse weeds and the leaves, twigs, and shoots of trees and shrubs to tender grasses. Also, they like to scatter and spread out, to keep moving from place to place, and to nibble here and there a little at a time rather than to advance slowly cleaning up one area at a time. However, if kept to one field or range they will eventually devour practically every green leaf and growth within their reach. Toward evening they work to the highest point of their range and seek a sheltered, well drained spot for the night. They should, therefore (1) be given plenty of room with plenty of scrub growth to browse upon and an abundance of pure water; (2) be corraled or penned every night; and, (3) be provided in the corral with a shed or lean-to, open to the least exposed quarter or downhill if on a slope, with a firm, *dry* floor, and a constant supply of salt or salt and tobacco for which they will come regularly each night. The shelter should provide plenty of space to prevent harmful crowding. In the South, and where there are rocky shelters and plenty of timber growth, such a building is rarely needed except at kidding time.

The pasture should be tightly fenced against dogs, wolves, etc., for although a goat will defend itself far better than a sheep, vermin are likely to cause considerable loss among the youngsters. Sometimes a few Angoras are added to a flock of sheep merely as a protection. They can profitably be run with horses and cattle since they not only do not eat the grass, but by destroying weeds, bushes, etc., actually thicken and improve the pasturage for the larger stock. Hogs and goats are a less desirable combination, since the former occasionally kill and eat the young kids. On the range the flock tends to keep together well and may be left for hours at a time perhaps in charge of a well-trained dog, the herdsman riding out two or three times a day to see that all is well.

Feeding. When there is plenty of brush and shrubbery available, Angora goats need no other feed except in winter and the special cases noted below. Some breeders carry their animals the year 'round without supplementary feed, but it is best to keep them thrifty by feeding enough hay, straw, or sheaf oats to make up for scanty pasturage. Overfeeding, especially of grain, is decidedly harmful, but a daily handful of oats will often bring around an animal that is out of condition. An occasional cabbage or some roots are always relished. Everything should be fed in racks or mangers so that it will not be pulled about,



FIG. 122. A purebred Angora buck, owned by Wm. Riddell and Sons, Oregon. Courtesy "The Angora Journal."



FIG. 123. Angora doe, Grand Champion at the Panama-Pacific Exposition. Owned by Wm. Riddell and Sons. Courtesy "The Angora Journal."

tramped on and wasted. The goat is very fussy about the cleanliness of its food. When special feeding is necessary any mixture of grains will do, although oats are the usual standby.

Plenty of clean, fresh water must always be at hand; also salt, either a lump of rock-salt in a box in the shed, or loose salt supplied at regular intervals. Some breeders advise keeping a tonic mixture of 1 part ground tobacco and 3 parts salt in an open box in the shed.

Breeding. Both sexes have periods of "heat," or breeding seasons, that of the doe lasting through September and October, and that of the buck being some 6 weeks longer at each end. No goat should be used for breeding purposes

until at least 18 months old. The gestation period is 5 months and it is best to plan to have the kids dropped after the worst weather of early spring is over. In the case of large flocks extend the breeding season so that the kidding season will also string out for several weeks and distribute the labor.

To put the buck in good condition, feed him a pint or so of grain daily for a few weeks before the breeding season begins. He should then be able to serve successfully 100 does, allowing 10 days of service, then 10 days of rest, 10 more of service, another rest and a final ten days of service. Dr. H. D. Parker of Oregon, advises keeping the buck with the does only at night. The doe should also be fed up as kidding time approaches to insure a good supply of milk, vetch, alfalfa, pea hay, roots (if not frozen) or a light grain ration being used.

At kidding time except in the South, a roomy, dry house must be ready for the does. It should contain small pens in which each doe can be kept with her young for a day or two until she "owns" it. Twins are rather uncommon but the crop may average close to 100 per cent. Though the young kids are more delicate than lambs, a small flock that can be sheltered in bad weather and kept near the shed for the first few weeks rarely presents any serious problems. In handling large flocks outdoors in the Southwest two systems are popular, either of which may be modified to suit local conditions.

The corral method enables three men to care for 1,000 does if only 75 to 100 kids are dropped daily. It requires (1) several wire fenced corrals each big enough to hold 50 does and their kids; (2) a much larger pen for ewes yet to kid; and (3) a second large corral with a dozen small pens along one side and an eighteen-inch board across the entrance to keep the kids back when the does are let out. Each day does due to kid are put in the small corrals and the rest of the flock taken from large corral No. 1 to the range, but brought back early enough so that any kids dropped on the way may be picked up and brought in. After 3 days in the small corrals, does and kids are turned into large corral No. 2 (with the

pens). Then the does are taken out by day and returned at night, care being taken that this "wet" band does not mix with the "dry" one that has not kidded. If any does are found without kids, or kids without mothers, these are paired up and left in the small pens until they accept each other. The kids should not be turned out until 6 or 8 weeks old and able to stay with the flock all day.

The staking method requires the preparation beforehand of a "toggle" or short piece of rope with a stake at one end and a swivel block in the middle, for each kid expected. As fast as born the kids are taken out and tied by a hind leg to one of these pegs, the doe following and looking after its offspring while

it feeds near by. There should be sunshine, shade and shelter for each kid which may be kept tied until 6 or 8 weeks old (the rope being changed to the other leg now and then to prevent chafing) or turned into a large corral as soon as fully owned by its dam.

Care of kids. Buck kids not wanted for breeding purposes should be castrated (p. 379) when 3 days old; some say when from 2 to 4 weeks. When 4 or 5 months old all kids are weaned and the unaltered bucks separated from the does. Unless the goats (both young and old) keep their feet worn down by running over rocks, etc., their hoofs should occasionally be trimmed with a sharp knife. If lice, ticks, or scab attack the flock it may be dipped (p. 131) but the dip must be weaker than that used for sheep. A yearly dipping after shearing is a wise precaution.

Shearing is done in the North in March and April and in the Southwest in February or March and again in the fall, since there the rapid change from the dry feed of winter to the green feed of spring causes Angoras to shed their fleece after 6 months or so. For the easy handling of goats, which are less gentle than sheep, a New Mexico breeder invented the shearing table pictured herewith (Fig. 125). The sides are propped up, the goat is thrown into the trough so formed on its back and held there by buckling a strap across its neck. Belly and legs are shorn, then the legs are tied together, the strap undone, the sides of the table dropped, and the shearing finished on the flat surface before the goat is untied. It is claimed that a man can handle 100 goats a day in this way.

Angora Products

Mohair. Angora fleece is known as *mohair*, and largely used for making plush, furniture covers, rugs, robes, Palm Beach cloth, and other materials for use and wear, in which both finish and strength are wanted. High grade Angoras grow an inch of fleece a month. Where shearing is practised once a year, the fleece will weigh from 2 to 12 pounds, averaging $3\frac{1}{2}$ to 5, the staple measuring 7 to 11 inches. By delaying the shearing and giving special care considerably greater yields are made sometimes, but not on a commercial scale. At the Panama-Pacific Exposition F. A. Pierce of Oregon exhibited a buck 43 months old that had never been shorn, on which the longest staple was $41\frac{1}{2}$ inches, the average length 29 inches and the total weight 22 pounds, 15 ounces. This record clip was sold for \$300 with the exception of some souvenir ringlets that brought \$32 and 2 pounds of the longest mohair that the owner saved and values at \$40.

The best mohair comes from young goats of good breeding. The mixture of common goat blood seems to increase the amount of *kemp* or short, coarse hair that lies beneath the fleece and lessens its value. The practice of shearing twice a year pulls down the average length of the American mohair clip which, however, is steadily improving in quality and increasing in quantity. The 1910 census reported 1,682,912 fleeces worth \$901,597 as compared with 454,932 worth

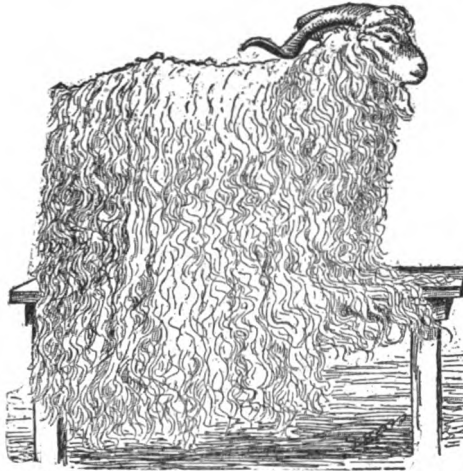


FIG. 124. "Dodo" and his record fleece part of which measured $41\frac{1}{2}$ inches. Except when on exhibition this was kept braided and tied up on his back.

\$267,864 in 1900. The 1915 crop in Texas alone was close to 5,000,000 pounds. Both demand and price have kept pace with this growth. In 1916 a practical Southwestern producer reported the following record prices received per pound for his clip on the open market:

Long 1st grade kid . . . . .	.65	cents
First combings . . . . .	.53	cents
First carding . . . . .	.45	cents
Long 2nd grade kid . . . . .	.60	cents
Second combings . . . . .	.42	cents
Second carding . . . . .	.38	cents
Average for entire clip . . . . .	.41	cents

Other Products

Leather and meat. Angora skins supply a fair grade of leather and, tanned with a short fleece left on, make handsome rugs, robes, etc. The flesh of the Angoras, especially kids, is comparable with the best mutton, and has long been sold as such to people who "didn't like the idea of eating goat's flesh." Pure food laws and a growing appreciation of its value are, however, gradually creating a sound, deserved demand for this meat under its own name. Kansas City is the centre of this trade and has set two market grades—"fat goats" and "brushers,"—corresponding to prime animals and stockers in the beef trade.

Angora goats being intelligent, quiet, and cleanly make good pets for children. But second only to their value as mohair producers is their usefulness as *land clearers*. Pastured on cutover or other scrub land they will devour every leaf and shoot in reach, kill and remove



FIG. 126. How goats clear land. Less than a month of grazing has removed a dense undergrowth and made way for a good stand of pasture grasses.

every stick of undergrowth and help establish a good stand of grass; and at the same time they will be growing mohair and producing kids. Two hundred head will destroy practically all the dense brush on 45 acres in a year; as a rough average 2 to 5 goats per acre will do this work in from 2 to 3 years. In the West large flocks are kept primarily to keep clear the fire lines in the National forests and the banks of main ditches of certain irrigation projects, but smaller ones are used all over the country in reclaiming waste land on individual farms. Since the goats eat a little here and a little there, they are less likely to injury by poisonous plants than are sheep or cattle which pasture closely and thoroughly as they go.

History, Importance, and Prices

The Angora is native to Turkey in Asia and first came to America in 1849. Other importations followed until by 1881, when Turkey put a stop to further exportation, we had a good foundation of pure blood. Some crossing with common stock has developed larger size and greater hardiness, and any resulting tendency toward poor mohair can be corrected by bringing in new, pure blood for a few years. An American Angora Breeders' Association for the promotion of purebreds was organized in 1900 and in 1917 had registered 80,146 bucks and does. There are also the National Mohair Growers' Association, a marketing organization; and various local bodies.

The demand for Angoras is brisk and prices are uniformly good. Grade does, suitable for the beginner to start with cost \$5 or less; registered does bring from \$15 to \$25 and bucks from \$40 to \$100. The goat that bore

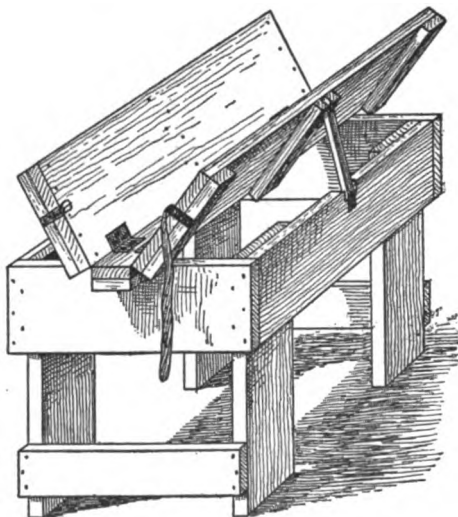


FIG. 125. Mr. F. W. Ludlow's shearing table described on page 125. Note how the sides are held up by braces; also the strap for holding the goat in place. (Farmers Bulletin 573.)

the record fleece mentioned above sold for \$300 while the record price for one individual is \$1,500. Needless to say, in taking up the raising of goats, one should start with a few

animals of good quality. Whether the does are grades or purebreds does not greatly matter, but the buck must be registered and of upstanding quality.

MILK GOATS

Prepared with the cooperation of the late FRED. C. LOUNSBURY, formerly Secretary of the International Nubian Milk Goat Association; and WINTHROP HOWLAND, Editor of the "Milk Goat Bulletin" and one of the largest and most successful of Western milk goat raisers.—EDITOR.

THE raising of goats especially adapted and developed to yield large quantities of milk offers attractions to suburbanite, village dweller, and farmer. It is no get-rich-quick business; but as a source of products for home use, or a branch of farming and animal industry, it will bring good returns if it receives proper attention. Three important points should, however, be kept in mind:

1. **The effect of environment.** The performances of milk goats even of similar breeding and quality vary in different sections. The biggest records are being made in California and it is doubtful whether similar results can be obtained anywhere else in the country. Goats are *browsers* and require fresh green feed; where they must be housed and dry fed part of the year, they cannot be expected to achieve maximum results.

2. **Milk goats are dairy animals.** The only way to improve them is to handle them as you would a dairy cow, feeding them well, caring for them, milking them regularly and not letting the kids nurse the does for 5 or 6 months. The latter is the easy way to raise kids—or calves—but it is the quickest way to lessen the mother's milk production.

3. **Milk goats need company.** A doe kept alone will fret and do poorly; two, or a doe and her kid, will be happy and thrive. They quickly respond to grooming, petting and attention.

Some advantages of Milk Goats. (1) Goats cost less to buy and keep than cows and can be kept where a cow would be out of the question. (2) The milk is palatable, wholesome, highly nutritious, and especially valuable for infant feeding. (3) Unlike the cow, the goat is practically immune to tuberculosis so there is little or no danger of contracting the disease through the use of its milk. This makes pasteurization unnecessary. (4) Under favorable conditions the raising of good grades and purebreds for breeding purposes is quite profitable.

Breeds

Depending on his knowledge, plans, and capital the beginner may buy (a) common American goats (some of which give fair amounts of milk) and by the use of good bucks make each generation a little better than the last; (b) grades of any desired degree of purity; or (c) purebreds of one of the follow-

ing breeds (these are of course less numerous and higher priced).

A. **Toggenburgs**, developed in Switzerland, are perhaps the best known in America. Varying in color from light fawn to dark chocolate with white on face and legs, generally hornless, hardy and gentle, they weigh up to 200 pounds for bucks and from 100 to 110 for does which average 3 or 4 quarts of milk a day.

B. **Saanens**, also from Switzerland, pure white, a little larger than Toggenburgs, also hornless, and equally hardy and valuable as milk producers.

C. **Anglo-Nubians** (now sometimes called Nubians) developed in England, are the largest of all; generally hornless, brown or black in color, and less hardy than the Swiss breeds, they give slightly less but considerably richer milk. They are practically free from the characteristic, offensive odor of bucks of all other breeds.

D. **Less important breeds** are the *Maltese*

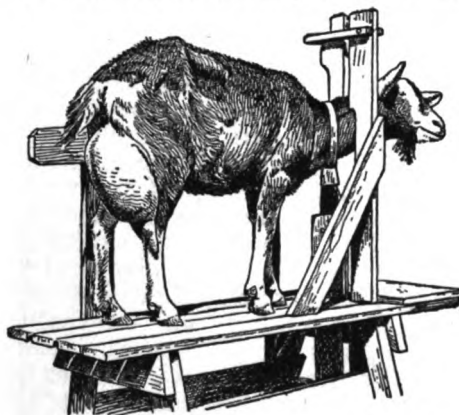


FIG. 127. Registered Toggenburg doe "Fannette." Weighing but 136 pounds, she has given 12 pounds of milk in a day, 84 pounds in a week and 2,680 in a season. Courtesy of Mr. Winthrop Howland.



FIG. 128. "Toggenburg Bill" a registered buck owned and used by the United States Department of Agriculture in its investigations.

of the Island of Malta and the *Nubian* of South Africa (used in the development of the Anglo-Nubian) neither of which can be imported into the United States because of quarantine laws; the *New Mexico* goat with fair quality but lacking uniformity; the rare *Spanish-Maltese* and a few other Swiss strains or types.

Cost and Returns

A "native" doe will cost from \$5 to \$20 according to locality and her quality. Kidding in February she should give a quart or so of milk a day for 4 to 6 or, rarely, 8 months. Some, perhaps half, of this will be needed for the kids, the rest, if sold may bring 10 to 25 cents a

quart, or, as cheese, 50 cents or more a pound. It will cost \$10 to \$25 to keep such a goat for a year, depending on location, cost of feed, climate, etc. A male kid by a common buck is worth a dollar or two when two weeks old in any foreign settlement; a doe kid, by a registered buck is worth \$10 at weaning time. These figures are for 1917.

A carefully selected common goat will give twice as much milk; a Swiss or Nubian grade three times as much; and a purebred up to 5 or 6 quarts daily for a longer period, sometimes up to 10 months. The more pure blood the offspring have the more they bring, three-quarter does being worth \$20 at weaning time and perhaps \$40 with their first kid, and purebred does and bucks anywhere up to \$150 or more. As long as purebreds are scarce and high priced good grade bucks will be better than nothing, especially for the beginner, but they are rarely if ever sold as breeding stock. Some breeders make a profitable practice of renting does in milk to families who want the milk for infants or invalids, but there is always danger of their being injured through ignorance, carelessness, or lonesomeness.

Milk Goat Management

Does breed only in September, October, and November (rarely in August or December). If size is greatly desired, 18 months old is none too soon to begin; but many does are well developed and ready for breeding at 8 to 12 months. Kids (usually twins and not uncommonly triplets) may be expected in 21 weeks. If large, vigorous stock is the main thing, don't wean kids until 4 or 5 months old, unless, in the case of bucks, they become too rough. See that the doe is nursed or milked clean, feeding the kids from bottles with regular nipples if desired. Get them started on grass as soon as possible, or give succulent roughage gradually adding a little grain. Brewers grains, wheat, and



FIG. 129. "Alta Jaure," an imported Saanen doe owned by Mrs. Inez Glahn of California. Her average daily production for 3 months was 6½ quarts of milk.

alfalfa bran, ground oats, barley and a little corn can all be used. Milk goats enjoy browsing, but they cannot support themselves and make milk on that alone. They stand tethering and confinement, but generous pasture and some liberty help to maintain their condition and reduce the cost of keeping them. Waste vegetables from the table add desirable variety, but they and all other food must be fresh, clean and sweet.

Their pasture must be enclosed by a 4-foot, tight, strong, wovenwire fence. Though hardy, Milk goats are not range animals and need a tight barn with stanchions or better still 4 x 5 foot box stalls. Because of their odor, bucks (except Anglo-Nubians) must be kept by themselves well away from the dairy, dwelling, highway, etc. The hoofs of stall fed goats grow rapidly and about once a month the outer shell should be carefully pared down with a strong knife to within one-eighth inch of the cushion of the foot.

Does are commonly bred to kid but once a year, being dried off after milking 10 months or so. If not with kid they may be milked as long as the flow lasts, which may be 18 months or more. A milking stand is most essential; if fed their grain at milking time, does will soon learn to jump up on it. A few

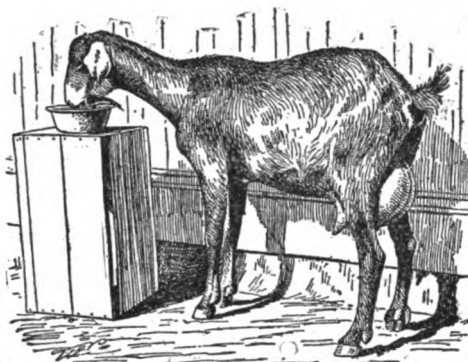


FIG. 130. Although only $\frac{1}{2}$ pure blood, this doe, "Ramona," bred by F. Randiuss of Colorado, shows typical Nubian form and quality.

heavy producers need to be milked 3 times daily, but the general rule is twice, regularity being essential. Milk from side or rear as preferred but be very patient and gentle, especially with young does, until they get quite used to the operation. Milk quickly and thoroughly, kneading the udder now and then to that end. Milk should not be used or sold for at least 10 days after kidding.

Goats' milk produced under sanitary conditions where good, clean feed is used is entirely palatable and pleasant. It may contain from 3.5 to 8 per cent fat; the globules being very small make the cream rise very slowly and render the milk almost impossible to separate and unsatisfactory for butter making. It makes excellent cheese and ice cream, however, and is very easily modified for infant feeding. Simple formulas prepared by Dr. Chas. E. Ide of Redlands, California, for a seven-pound baby are as follows (for larger infants increase the amount of milk by $1\frac{1}{2}$ ounce in 24 hours for each additional pound):

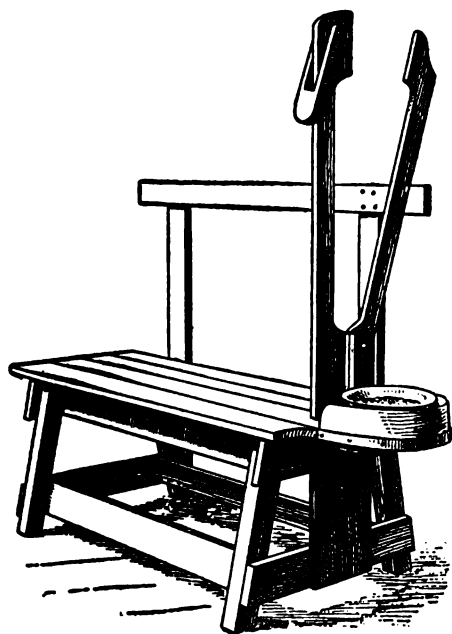


FIG. 131. Milking stand designed by Mr. Winthrop Howland. Length (stanchion to rear) 3 $\frac{1}{2}$ feet; width 18 inches; height from ground 17 $\frac{1}{2}$ inches; guard rail 20 inches high; 3 $\frac{1}{2}$ feet long. Right half of stanchion is fixed, the left half is pivoted. The opening is 8 inches from floor of stand, 23 inches high and 3 $\frac{1}{2}$ inches wide.

	1ST MONTH	2ND MONTH	3D MONTH	4TH MONTH
Milk.....	1 oz.	2 oz.	3 oz.	5 oz.
Lime Water.....	2 teasp.	2 teasp.		
Milk, cane or malt sugar.....	1 teasp.			
Distilled water.....	1-2 oz.	2 oz.	2 oz.	1 oz.

Milk goat skin supplies leather of the finest grade; the *meat* is equal to that of the Angora; but milk and breeding stock are the main sources of profit.

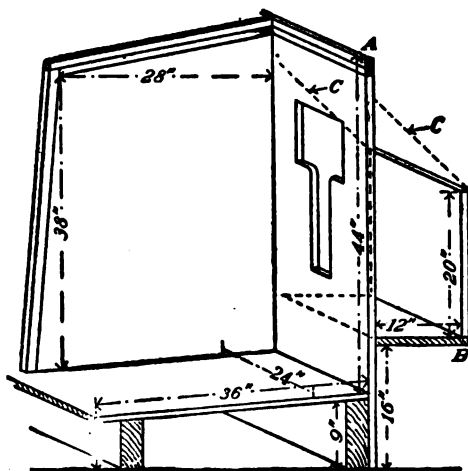


FIG. 132. Stall arranged for milk goats, designed and used with great success by the late F. C. Lounsbury, New Jersey. There should be a partition between each two stalls and preferably between feed boxes, as shown at C.

Where Raised, Organizations

Milk goats are now raised in all parts of the country, but, commercially, chiefly in the Pacific Coast states, yet the first importa-

tion of purebreds, consisting of four Toggenburgs, was not made until 1893. The next large importation, including some Saanens, occurred in 1904. In 1902 there was formed the American Milch Goat Record Association (J. C. Darst, Secretary, Dayton, O.) which registers pure stock of any breed; any doe of any breed, native foreign or grade, that gives two quarts of milk a day when fresh and any female kid from registered sire and dam. In 1916 the International Nubian Breeders' Association, was formed to promote the interests of the Anglo-Nubian goat; it registers only this type (including purebreds and grades) each certificate stating the percentage of Anglo-Nubian blood carried by the animal. (A. C. Talboy, Sec'y, San Diego, Cal.)

Practical Pointers

Goats' milk cheese. The following simple directions are given by a practical goat raiser, Miss B. A. R. Stocker of California: "Get a bottle of rennet tablets for cheese (not junket). I use about 8 pounds of milk: put in rather more rennet than they say and leave it a whole hour to set. Then cut the curd and raise to 98 degrees, no higher, stirring gently every few minutes; cover and set away again for an hour longer. Drain on a sieve lined with muslin, and pack

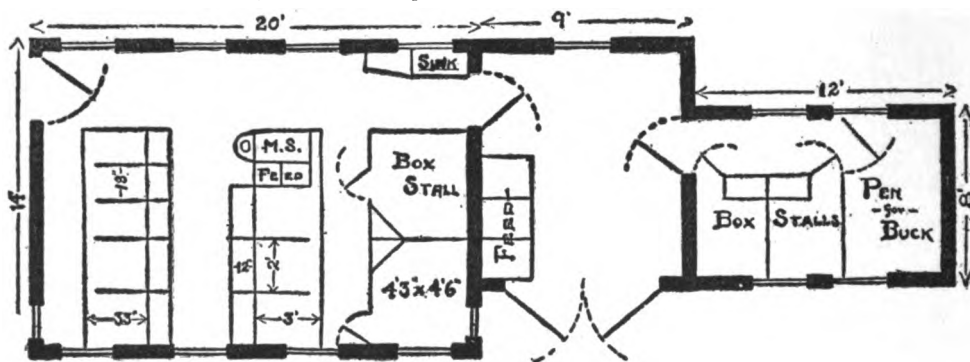


FIG. 133. Plan and dimensions of Mr. Lounsbury's goat shed. M. S. stands for milking stand.

into a mold, salting and pressing down all the time. Put a follower and weight on top and set away for 24 hours. Take out and set on a screen tray in an airy situation, with a soft folded cloth under the cheese, and a bit of muslin over it to keep off the dust. Turn every day for 10 or 12 days, changing the cloth underneath as often. Now it is sufficiently cured to cover with wax. Melt some paraffin wax in a tin lid and turn your cheese in it carefully till it is well coated all over.

"For a mold I have used a one-pound tin such as holds ground coffee, melted out the bottom and punched holes in the lid for a bottom. All I had to buy was a disk of stout dairy tin cut off to fit the inside on top. For a weight I use a quart jar filled with sand. Line your mold with thin muslin. You can use all your spare milk 2 or 3 times a week, as long as it is perfectly sweet. 7 or 8 pounds

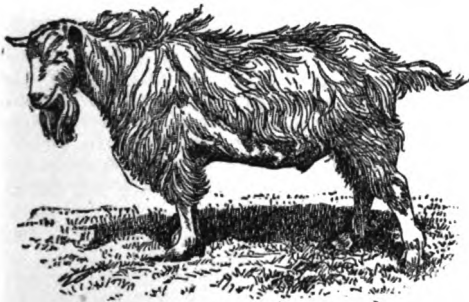


FIG. 134. A typical Saanen buck owned by the United States Department of Agriculture. From photograph by Mr. Millin of the Department.

of milk make a pound of cheese. I keep the cheeses on a glass shelf in the pantry. A cellar would be better."

A good dip for goats. Arsenic 1 pound (may be omitted if desired), sulphur 2 pounds, air slaked lime 3 pounds, Gold Dust washing powder 2 three-and-a-half pound packages, hot water 3 gallons. For use, add this to 100 gallons lukewarm water. In dipping keep goat under all but face and mouth for one minute; then put one hand over mouth and nostrils and push head entirely under for not more than 10 seconds. Let goats drain well on cement or slatted floor before turning them out, and don't dip in cold weather.

What causes lumps to develop on the throat and under the jaw of kids? They grow from the size of lima beans to that of kidneys and finally kill the kids, which first lose their activity, become abnormally fat, and then stop eating.

This is the result of giving pregnant does too much feed and not enough exercise. Usu-



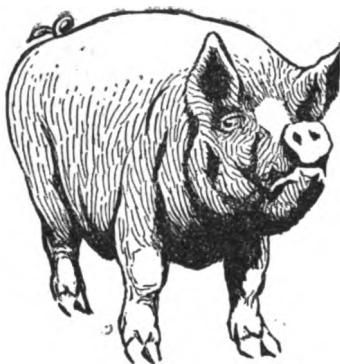
FIG. 135. A young, purebred Nubian doe. From photograph by Mr. Millin

ally it is the kids born late in the season that are affected. There is no cure for advanced cases, but small lumps can often be cured by trimming the hair off, swabbing them with iodine and tying flannel around the neck so as to cause blistering.

Telling a goat's age. Between the first and fifth year this can be done with fair accuracy by examining the teeth. Thereafter they remain the same except for wear, breakage, etc., which gives only an approximate guide. A one-year old goat has 32 teeth, 6 molars or grinders on each side of each jaw and 8 incisors or biters on the lower jaw only. At about 14 months the 2 centre incisors fall out and 2 larger ones take their places; the third year the next 2 are replaced; the fourth year the next 2 and the fifth year the goat has a "full mouth" of large, firm teeth.

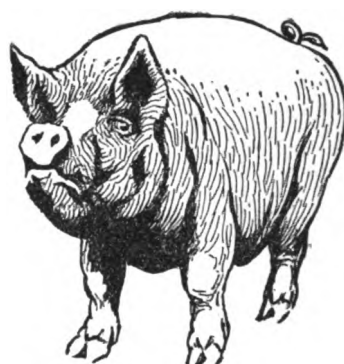


FIG. 136. "Abou Ben Adhem," a representative Nubian buck, owned by the late F. C. Lounsbury. From photograph by Mr. Millin.



SECTION FOUR

SWINE



CHAPTER 13

How to Raise Hogs

By **FREDERICK C. MINKLER** and **WILLIAM S. CORSA**. *Professor Minkler is Superintendent of the Briar Cliff Farms of New York and was formerly Live Stock Commissioner of New Jersey and Professor of Animal Husbandry at Rutgers College in that State. His first knowledge of hog raising, gained on the home farm in Iowa, has been supplemented by study at the Iowa State College, by experience as manager of the New Jersey College Farm and by investigations carried on there. His effective, practical teachings are giving the hog a new, important, profitable place in eastern agriculture. Mr. Corsa is a practical, widely known hog raiser who has attained real success on his Gregory Farms in Illinois and Nebraska, in the show rings of state and national fairs, and at public and private sales.*—EDITOR.

PORK production is an industry for both the general farmer who wants to produce enough fresh or cured meat for home use, and the live stock farmer who looks upon swine as a money crop. The initial expense for animals and equipment is small; the use of the "self feeder" and other modern appliances simplifies the labor problem; and the American hog is a highly economical unit for converting farm products and a great variety of waste products from table, garden, and field into pork products that can be advantageously used or profitably sold. Dr. W. H. Jordan of the New York State Experiment Station has found that the dairy cow can produce 18 pounds of edible solids from each 100 pounds of digestible nutrients consumed; measured by the same standard the pig can produce 15.16 pounds, as compared with 2.75 pounds and 2.6 pounds in the case of the beef steer and the fat sheep respectively. Almost every farm can provide refuse products that can be used to advantage in feeding pigs of any age, or can obtain them at practically no cost from households, institutions, or cities.

Two factors are necessary for success in raising pigs: (1) Sufficient corn, rye, etc., to supply the bulk of the concentrated feed needed in growing and fattening the animals; (2) Enough natural grass land or acreage of forage crops so that the animals need not be confined in small pens where it is absolutely impossible to keep them clean or healthy. The soil of the site selected should therefore be strong and rich in mineral matter, and at the same time well drained so that ravages of parasites and diseases may be avoided. Plenty of shade is very important; it is hard to keep fat hogs and brood sows cool in summer without shade—either natural or artificial—and abundant fresh water. Careful, generous fencing indicates efficient management and makes it possible to produce the largest number of healthy animals at the least expense. Disappointment and loss are sure to follow strict confinement of animals to pens and the purchase of all the feed used.

Quarters for Hogs

Shelter. There are two solutions of the housing problem; the central swine building system and the individual colony house system. A combination of the two is probably best where pigs for breeding as well as market are produced; on the average farm the colony system is popular and convenient. The house is inexpensive (costing about \$12.50 complete), sanitary, and easy to move about. This makes it possible to keep brood sows

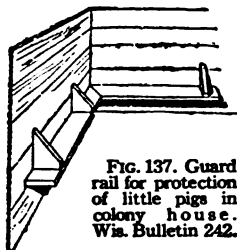


FIG. 137. Guard rail for protection of little pigs in colony house. Wis. Bulletin 242.

quietly by themselves at farrowing time and to quarantine any one animal in case disease is suspected. If you want to winter brood sows in them, the colony houses can be grouped and partially surrounded by a windbreak of woven wire covered with corn fodder, stalks, straw, etc. The important thing in housing swine in cold weather is not to keep them warm, but rather to keep them dry and out of draughts; this is ordinarily easier than keeping them cool in summer. If the houses are placed some distance from the feeding floor or troughs, breeding animals will be sure to get much needed, regular exercise which may not be the case when they are confined in separate pens in a central building. Colony houses also result in economy in bedding and a reduced labor cost; the vigor and vitality of animals so housed is clearly evident. Build a guard rail around the inside of each house 8 inches from the floor and 8 inches out from the sides as a protection for the young pigs which soon learn to seek it. Thus a larger percentage of the pigs can be raised and a large increase—the most important item in swine management—can be assured. In addition to providing protection in the winter, the colony house is useful in hot weather when natural shade is not available.

Fencing and yardage. Half acre (about 40 x 450 feet) lots, one for each colony house, make splendid yard units and may also be used to grow forage crops and thereby help to keep the quarters clean and sanitary. An

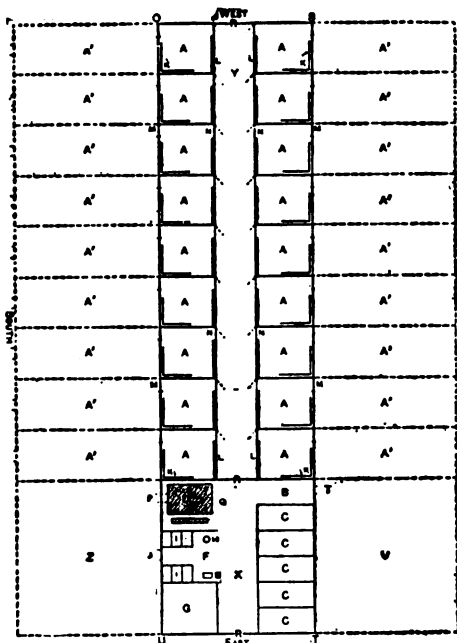


FIG. 138. Plan of central hog house (120 x 30 feet) and yards. A, pen 10 x 10 feet with door M into yard A, and door N into alley Y, 8 feet wide; B, alley leading through door T into yard V; C and I feed bins; D, platform scales with runway and door P into yard Z; E stove for heating slop; F, feed mixing room with door J; G, office; H, water hydrant; K, fender as shown in Fig. 137; L, feeding trough with swinging partition as in Fig. 142. (Ill. Bulletin 109.)

acre of forage crops will provide succulent feed for 2,000 pounds live weight of hogs throughout the season. A 24-inch woven wire fence on steel or wooden posts, with barbed wire at the top and bottom will keep hogs inside such areas. With such a yardage scheme in operation it is possible to run temporary fences across one of the lots at intervals of 50 feet, put a colony house in each section and provide farrowing quarters for 9 brood sows during the early spring season. When the pigs are 2 to 3 weeks old they can be taken from these small areas, grouped according to age or size and turned out in lots with their dams on to the larger forage crop areas.

Choosing the Stock

Usually too much emphasis is placed on the choice of a breed. Breeds vary in color, size, prolificacy, age of maturity, and inherited feeding qualities, but there are good and poor animals in each. It is more important to carefully choose a good individual of any one breed, than to suppose that one breed is far superior to another and that one's success will be limited by the breed he finally selects. The question of type is of more importance. The so-called lard hog (p. 144), distinctly a fat-producing animal, and popular in the corn belt and sections where

dairy products are not generally available for swine feeding, is the leading utility type. The bacon type (p. 144), is produced very successfully in sections of New York, Wisconsin, Minnesota, and especially throughout Canada where skim milk and buttermilk are available and where the market prefers a well marbled carcass to the mere growth of flesh. Where buyers offer no more for prime 175-pound bacon carcasses than for 250-pound fat hogs, the latter should always be produced. A special private trade that appreciates quality may make an exception possible. Representatives of the fat hog type reach the useful weight of 225 pounds (dressed) at an earlier age than do those of the bacon type; furthermore, such animals are better adapted to either pen feeding or foraging and consequently are better suited for the average farm. More skill and knowledge in feeding, and greater variety of feeding stuffs are required to finish bacon hogs than to merely develop or fatten lard hogs.

The Brood Sow

The brood sow is the unit of pork production and should represent a happy combination of breeding and individual excellence. Utility from the butchers' standpoint should be the basis for judging every characteristic and that individual should be chosen which combines weight with quality. A brood sow should possess sufficient breeding to rank her as a purebred animal even though not registered; she should be well grown and developed, show maturity at an early age, and trace back to a large, even litter, farrowed by a kindly disposed, heavy milking dam of size and vigor. Individually, she should possess a clean shapely head, large bright eyes, heavy, well set jaws, light, neat jowl, trim ears and a short smooth neck; a long, straight, broad back, smooth, compact shoulders, deep, well-arched ribs, and be of even width throughout; her hams should be plump and shapely, with good length from top to bottom; her underline should be trim and dotted with many evenly placed rudimentaries; her legs should be straight and strong with clean dense bone, and the pasterns strongly supported; from every viewpoint she should exhibit style, finish, symmetry, and quality as shown by a fine, silky coat of hair, a refined head and

shoulders, clean fine bone, low flanks and a trim belly. Avoid all highly conditioned show animals for breeding purposes; they are often unable to reproduce regularly or in satisfactory numbers. The importance of her milking qualities can not be overemphasized; in proportion to her weight the brood sow yields daily as large a quantity of milk solids as a good cow.

The Breeding Male

Choose the herd boar with great care and never think of using anything but a purebred. He may be of whatever breed you prefer or consider best for the purpose in view, but he *must* be prepotent, that is, able to fix in his progeny the qualities that make up his own individuality. He should be masculine, resolute, vigorous, possess the same meat-making qualities as are desired in his pigs, and be typical of the same breed as the sows to which he is to be mated.

If you desire to mate mature sows, the boar should be from 12 to 18 months of age although most boar pigs are sold to the trade when they have reached the serviceable age of 9 months. Boars should be retained in the herd as long as they are able to regularly settle the sows mated; their usefulness may cover from 5 to 10 years. The use of the breeding crate makes breeding easier and makes it possible to use mature males on immature sows. It is a pity to retire from service a sire that has proved his usefulness, prepotency, and individuality simply because it is more convenient or profitable at the moment to sell him at the end of the breeding season and engage the services of a young boar for the next year.

If you buy a boar and have him shipped to your farm, disinfect him, while still in the crate, with a 3 per cent coal tar solution, then turn him out in some comfortable place where there are no other hogs to bother him and where he can rest and gradually exercise out of the cramped condition that almost always follows shipment in a crate. Feed him sparingly at first and gradually develop

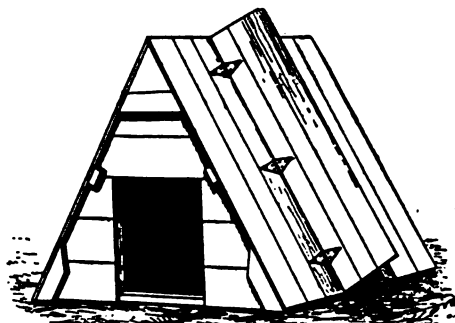


FIG. 139. The "Economy" A-shaped colony house, one of the simplest and most practical for the average farmer. (Ia. Bulletin 152.)

his appetite; for best results a boar should gain in flesh throughout the breeding season. When he becomes used to his new surroundings, he may be given his first try-out in service. At this critical time do not bring in to the young and inexperienced boar, an old, ugly sow that may fight him and turn him into a timid service boar, but rather a gilt or young sow of about the boar's age. Make sure that she is ready for service and take her to the boar's pen, not the boar to the brood sow lot.

The development of a sure breeder depends upon two equally important things; feed, and exercise. It is possible for a boar to take too much feed, but not too much exercise. If he can roam over a good pasture and forage for part of his living, so much the better. Keep the boar away from the sows except during the breeding season; even then it is desirable that they be kept in lots some distance apart. Never let the sows run in lots next to the boar's enclosure for he is liable to rant, fret, and grow thin just when he should be undisturbed and building up strength for the coming breeding season.

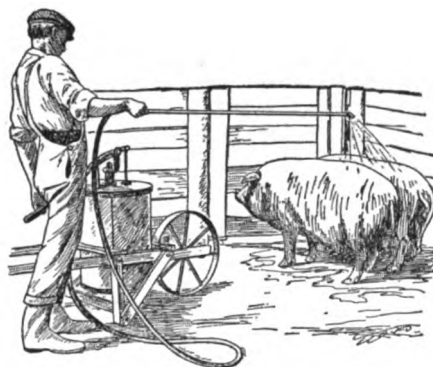


FIG. 140. Spraying large hogs that cannot conveniently be dipped

Above all never let the boar run with the sows and mate with any and all sows, repeatedly, or his vitality will be injured and his pigs suffer as a result. Use *mature, tried males* and keep them in service as long as they are good breeders.

How to Start a Herd

One of two possible plans is to purchase a number of pigs at weaning age and develop them to the breeding age, selecting for mating purposes those individuals that show normal development. The other method involves the purchase of bred gilts or sows. For the beginner who has had little experience in swine management the first method is probably the safer. It requires less capital; by it the pigs are grown and developed to fit the conditions on the farm concerned; the first delivery charges are small; and if loss and discouragement follow, the experience will be less costly. The careful buyer will choose the young animals from a number of herds so that he may breed together unrelated animals. The disadvantage of the system is that it takes somewhat longer to launch the industry than if bred sows were purchased at the outset. For the experienced farmer a combination of the two methods is recommended; this would mean the buying of a number of bred sows together with a larger number of young pigs varying in age from weanlings up to 6 months old. If it is desired to engage only in pork production rather than in swine breeding, it is possible to assemble any number of pigs at weaning age in April or May, feed them through the summer and fall season, and dispose of the entire herd during early winter.

While stock can be bought at large and small consignment sales such as are held in many western and middle western sections, it is usually safer for the beginner to deal privately with one or more responsible breeders, with whom definite agreements can be made, and from whom guarantees of the breeding value of various animals can be obtained at prices that are fair to both buyer and seller.

Profits in pig raising are limited by four factors, namely: prolificacy, early maturity, economical feeding practice, and sanitation; if any one of these is disregarded the prospects for success are small.

Feed liberally. It is vitally important that the pig be kept growing and gaining from the very first. Its sole business is to eat, sleep, and gain in weight, especially if it is being developed for market purposes. Naturally, it is born with a healthy appetite, which should always be satisfied. Early maturity is just as

important for the consumer as for the producer. The farmer wants it because it shortens the growing and feeding period, and because young animals gain more economically than older ones. The consumer prefers pork that is rapidly formed, since it is more tender and its flavor is more delicate. Yet this rapid growth must be the result of careful feeding, for feed is high priced, labor is an expensive item, and unusually great or rapid gains may cost more than they are worth.

Breeding Management

Age to breed. Gilts may be bred when 9 months old, if well grown; but unless they clearly exhibit size, vigor, and maturity they should be sold for pork and not mated. Young boars may be given light service at 9 or 10 months. Two litters a year, farrowed preferably in March and September, or April and October, may be obtained from a sow during and after her second year of usefulness. It is well to have young sows produce their first litters in May or June when they may be on forage crops which stimulate their flow of milk. A brood sow, like a boar, should be retained in service as long as she breeds regularly and raises a large percentage of the pigs she farrows; this may be until she is 10 years of age or even older. Brood sows and gilts should be rather thin at the mating season, though they may be flushed for 10 days before breeding to encourage the mating instinct. After they are safely settled they should be fed liberally; in fact they should gain from three quarters of a pound to a pound a day apiece throughout their pregnancy. Increase the bulk of the ration by feeding more alfalfa hay and decrease the amount of grain just before farrowing.

Mating. The sow's gestation period varies from 114 to 116 days. Under normal conditions brood sows will come in heat every 21 days during the breeding season and remain

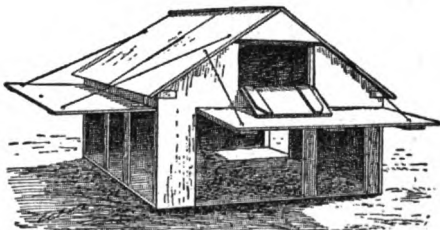


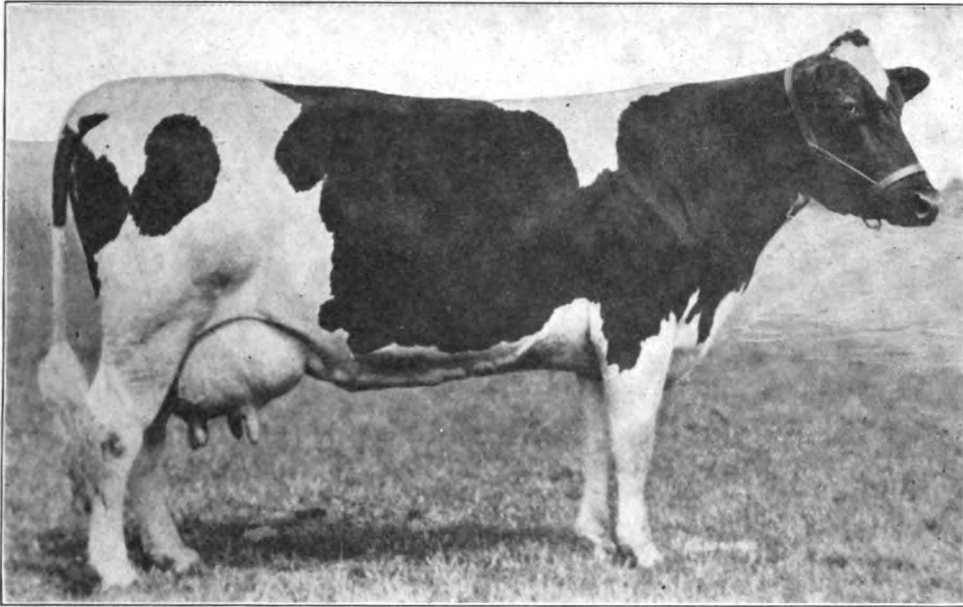
FIG. 141. The Iowa gable colony house with all doors and windows open to give the most shade and ventilation in summer. (Ia. Bulletin 152).

so for 2 to 3 days. Flushing (that is, supplying extra feed to sows in poor condition as the breeding season approaches) prompts them to come in heat and makes it possible for all the herd to be mated within 4 weeks. Best results are secured by keeping the sow by herself at this time and mating her with a vigorous, regularly exercised boar. One uninterrupted service is enough, but to make sure that she is safely settled she should be watched closely during the following 3 weeks and rebred if necessary. In some cases it is advisable to drive the herd boar through the brood sow lot to detect any animals that are in heat or to make sure that all are safely settled.

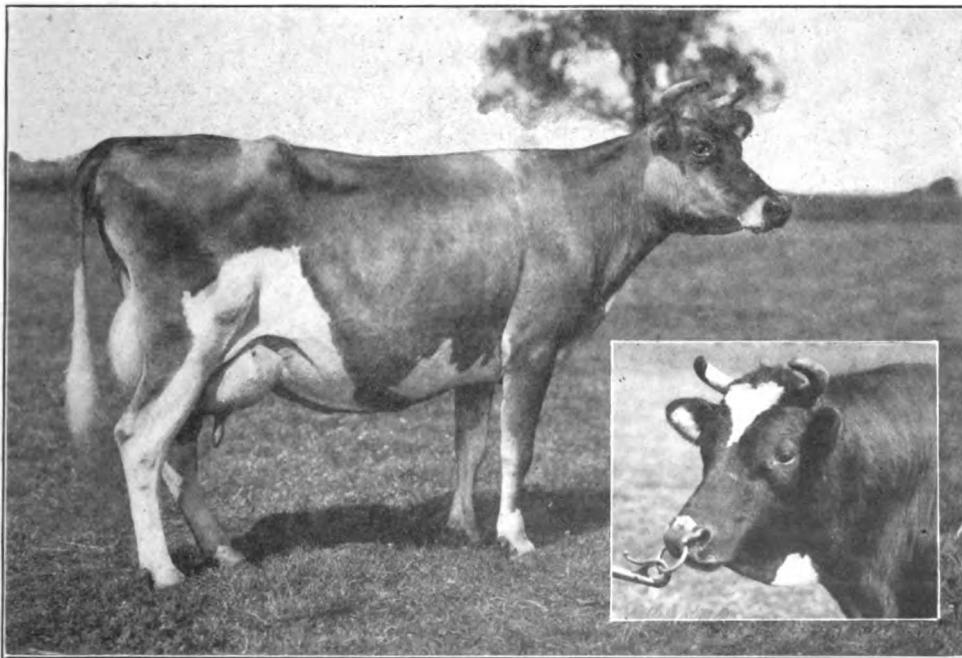
Closely related animals should not be mated without careful thought and full knowledge of what results are desired, for unsystematic in-breeding of animals unsuited for mating is apt to reduce size, impair vigor, and produce shy, irregular breeders. Strong, vigorous, well grown individuals may be in-bred within certain limits in order to fix type and color markings and make the herd uniform. Cross breeding, that is, using a boar of one breed on sows of other breeds, is useful only in the production of market pigs to which it gives vigor and size and in which uniformity is not essential.

Care of the pregnant sow. If the aim is to produce a carload of hogs or more for the fall market, the pigs should all be farrowed at the same time of year, namely, as early in the spring as possible. If the sows are mated about November 10, the litters will begin to arrive in early March. If the plans involve still larger production, provision as to lots, houses, etc., should be made so that the families may be removed from the farrowing house regularly each month. In this way a farrowing house to accommodate 10 sows at a time could care for this number each month, beginning preferably with February and continuing through April. During May and June, if the breeding operations are large enough to warrant it, litters may be farrowed directly in the colony houses.

A common mistake is to allow pregnant sows to run together in large numbers; the fewer that can be kept together, the better the

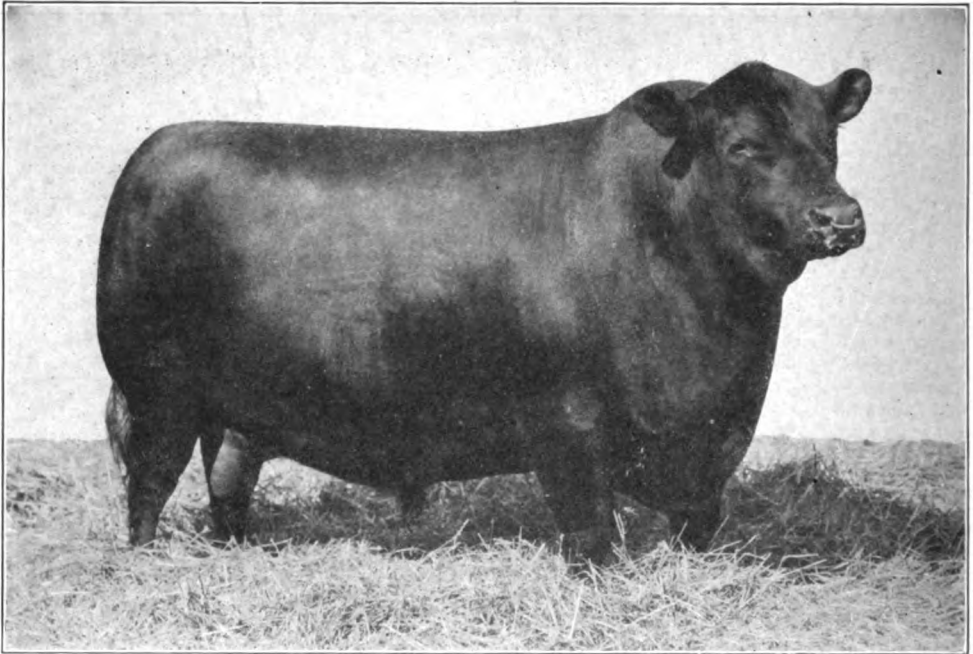


The Holstein-Friesian, the largest in size and yield of all the dairy breeds
(See page 103 for a typical bull)

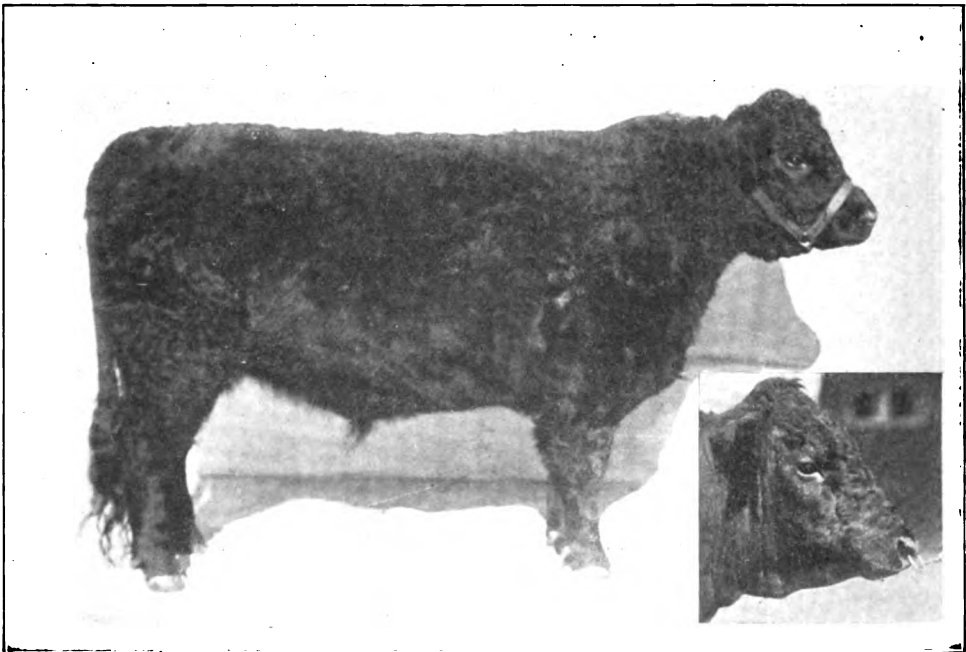


The Jersey, noted for refinement, beauty, and the richness of its product

THE LEADING DAIRY BREEDS—II



The Aberdeen-Angus, always polled, black, and sleek; unexcelled for the feed lot



The Galloway, also black and polled, but with a longer coat and a tendency to roundness rather than squareness

THE LEADING BEEF BREEDS—I

prospects for a successful pig crop. During advanced pregnancy no more than 4 sows should run together. Brood sows should be fed so that from the time they become pregnant until they farrow they will make moderate daily gains, preferably about a pound per day. They must also get abundant exercise up until the very date of farrowing. At least a week or 10 days before this event, put the sow in her new quarters in the farrowing house so that she will not be unduly restless when her pigs are born.

Farrowing. When hogs are raised in large numbers it is not always possible to keep track of the date that each one was bred or rebred and when it will probably farrow; and even if the herdsman has the exact date of service, he must know enough to recognize the signs of farrowing. Milk will form in the udder a few hours previous to the arrival of the pigs and if the sows are gentle enough to be handled, this fact provides a good guide. The attendant should be on hand at farrowing time especially if the weather is cold and unpleasant. Then he can remove each pig as it arrives, dry it with a warm cloth and put it in a box, barrel or other place where it can be kept warm until the entire family is assembled and can be put back with the sow for their first breakfast. For 24 hours after farrowing let the sow rest quietly. *Give her no feed but supply all the warm water she wants to drink.* Be sure that the afterbirth is promptly removed and burned or buried. The vicious habit of pig eating often starts when a sow is allowed to eat the afterbirth or bits of cord that slough off the navels of the young pigs. Do not stimulate milk secretion until the pigs are old enough to make their wants known. Most pig losses occur during the first 48 hours of their life, either through neglect on the part of the attendant, lack of motherly instinct on the part of the sow or inherited weakness in the pigs; if a pig can be saved for the first 2 or 3 days he is reasonably sure to develop continuously. Many hog raisers consider it safest not to leave sow and pigs (especially valuable ones) together without some one near to watch them the first few days.

Care of the nursing sow and pigs. The commonest mistake for the first 3 weeks of the nursing period is the overfeeding of the sow. A moderate ration, not too rich, may not make the pigs quite so sleek and fat to begin with, but it will be better for them in the long run. They must have exercise, outside the farrowing house if possible, inside if the weather is bad. Small doors can be made in the front of the farrowing pens to let them run in the feeding alley whenever they like, or they may be driven up and down the alleyway by the herdsman now and then to get their exercise. Lack of activity often results in a sluggish circulation and labored breathing which develop into the condition commonly known as "thumps." Bleeding

at the tail may relieve this condition but exercise is by all odds the best preventive.

Remove the brood sows and pigs from the farrowing house to the colony house at the earliest possible date, depending, of course, upon weather conditions. Hereafter they will be able to get plenty of exercise so it will be safe to keep their appetites fully satisfied. After they are 10 days old, but while suckling, put within their reach a creep which the sow cannot get to but from which they can nibble at well soaked, shelled corn, sprinkled over with middlings and tankage. The self-feeder (see Fig. 143) can also be safely used after the pigs are 3 weeks old. Thus fed the pigs grow rapidly, do not pull down their mothers as

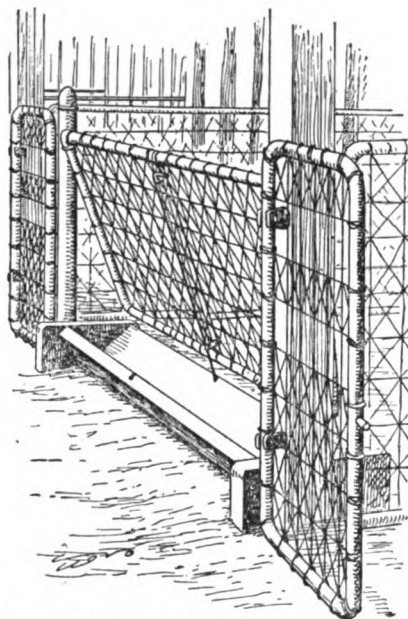


FIG. 142. Feed trough and swinging partition (which may be of wood or metal) to keep pigs out while it is being filled. (Ill. Bulletin 109).

much as they would if kept on milk alone, and are weaned more easily with little or no check in growth.

Weaning. The time to wean pigs varies with different breeds, from 6 to 12 weeks of age. Generally 8 weeks gives the best results providing the pigs have been well supplied with feed that they like. The best plan is to remove the sow and leave the pigs in the place they are used to. Hold back the sow's grain ration for a day or two before moving her, then put her in a dry lot and feed her very lightly until she has thoroughly dried up, which may take a week or 10 days. Look out that she does not try to satisfy her ravenous appetite at this time by devouring cinders or other coarse, injurious substances.

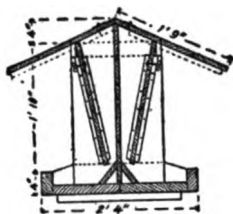


FIG. 143. Dimensions of a self-feeder shown in Fig. 146.

Later put all the dry sows in one pasture; those that have been pulled down will come back easily without grain if they have a good forage crop to run on.

Divide the weaned pigs into groups containing animals of the same size; all that are thrifty and doing well may be left together

but any little fellows that are robbed of their share of feed by their greedy companions should be placed in a lot by themselves where they can be given special care and extra feed. Kill and bury all the runts; they invite disease and court disaster and loss if allowed to run from lot to lot among the healthy pigs. Before moving pigs into new quarters, spray them with some coal tar dip or with crude oil, and clean and disinfect both the quarters that they go into and those from which they come.

Pigs intended for market should receive grain in addition to their forage crop. An excellent plan is to provide a self-feeder which permits the so-called "free choice system." There is some difference of opinion as to when the self-feeder should be installed,

but it is thought to be most useful in connection with brood sows nursing young pigs. In that case when you wean the pigs and begin to feed them largely on forage crops, give them about 8 pounds of corn daily for each 100 pounds live weight, until they reach 125 pounds when the self-feeder can be installed and the pigs pushed on to maturity. If the self-feeder is used continuously from weaning time onward, the pigs consume less of the forage crops, and reach maturity from 30 to 60 days earlier than if given a limited amount of feed. Thus early pigs make the best use of forage, while late pigs can often be forced by means of the self-feeder.

One self-feeder, containing cheap but absolutely necessary mineral materials should be kept before the pigs at all times. The mixture should consist of: lime slaked with salt 10 pounds, wood ashes 1 bushel, charcoal 2 bushels, finely ground phosphate rock 10 pounds, bone meal 10 pounds, and a sprinkling of sulphur and copperas.

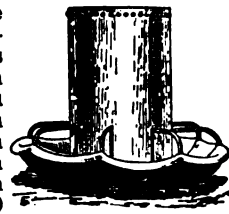


FIG. 144. A popular self-feeder devised by Mr. N. H. Gentry of Missouri. It is made of half an old water boiler, with slits sawed up so that it fits down over the common iron feeder found on many farms.

Feeding Hogs

The cost of a pound of gain increases with the age of the pig; it has been shown that the third 100 pounds of gain costs quite as much as the first and second together; hence the advantage of growing, fattening, and placing animals on the market at the earliest possible age. Both packer and butcher prefer light weight carcasses; pigs weighing from 175 to 225 pounds on the hoof are the most popular and profitable. Little is gained by grinding corn and it is a distinctly poor practice to steam or cook it; rye, barley, and wheat *should* be ground. Alfalfa may be fed satisfactorily to mature animals in slat racks, but grinding enables them to eat much more. Hominy meal is equal to cornmeal in feeding value; molasses may replace either of these weight for weight if the price is not too high. Oats are not adapted to swine feeding because of their cost and coarseness. Tankage (a refuse material from slaughter houses) is the most economical protein feed available but only the highest grade analyzing 60 per cent protein should be used. Red Dog flour, wheat middlings and various mill by-products are useful whenever they can be bought at a reasonable price. A variety of feeds should always be supplied so that the fattening pigs may eat to their limit at all times. Skimmilk and buttermilk are

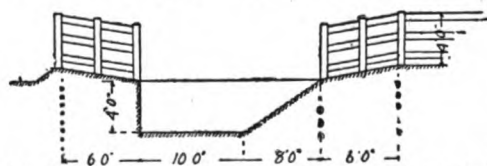


FIG. 145. Section of a dipping tank for swine. It is 2 feet wide at the top and about 1½ feet at the bottom

good to supplement a grain ration, but not more than 4 or 5 pounds to each pound of grain should be fed daily. Feed either sweet or sour milk regularly; don't jump from one to the other or the digestive system may be thrown out of gear. Keep the pigs' appetites on edge; do not overfeed on thin slops.

Sample Rations for Dry Lot Feeding**FOR SUCKLING PIGS—5 to 40 POUNDS (LIVE WEIGHT)**

1. { Corn or hominy meal 60 lbs.
Red Dog flour 30 "
Digester tankage 10 "
2. Corn, middlings, and tankage in self-feeder

FOR WEANLING PIGS—40 to 100 POUNDS

1. { Corn or hominy meal 70 lbs.
Digester tankage 10 "
Oil meal 5 "
Middlings 15 "
2. { Hominy meal 40 lbs.
Molasses 20 "
Ground rye 25 "
Digester tankage 15 "
3. Corn, hominy meal, ground rye and tankage in self-feeder

FOR SHOATS—100 to 150 POUNDS

1. { Corn 85 lbs.
Digester tankage 15 "
2. { Hominy meal 70 lbs.
Middlings 15 "
Digester tankage 15 "
3. { Corn 25 lbs.
Ground rye 25 "
Black strap molasses 25 "
Middlings 15 "
Tankage 10 "
4. Corn, hominy meal, ground rye and tankage in self-feeder

FOR FAT HOGS—150 to 250 POUNDS

1. { Corn or hominy meal 95 lbs.
Digester tankage 5 "
2. { Ground rye 35 lbs.
Hominy meal 35 "
Molasses 20 "
Digester tankage 5 "

3. Corn, hominy meal, ground rye and tankage in self-feeder

FOR BROOD SOWS

1. { Ear corn 60 lbs.
Alfalfa hay 40 "
2. { Shelled corn 88 lbs.
Digester tankage 12 "
3. { Corn meal 30 lbs.
Ground alfalfa hay 30 "
Black strap molasses 30 "
Digester tankage 10 "
4. { Corn meal 40 lbs.
Ground alfalfa 20 "
Oil meal 20 "
5. { Hominy meal 70 lbs.
Middlings 20 "
Digester tankage 10 "

Mixed and fed in self-feeder

6. Alfalfa hay in racks supplemented with sufficient ear corn to enable pregnant sows to gain one pound a day during the entire gestation period.

FOR BROOD SOWS NURSING PIGS

1. { Corn 50 lbs.
Ground rye 25 "
Middlings 15 "
Digester tankage 10 "
2. { Hominy meal 50 lbs.
Black strap molasses 25 "
Middlings 15 "
Digester tankage 10 "
3. Corn, rye, or hominy meal with middlings and tankage in self-feeder after the pigs are 10 days old.

FOR FATTENING OLD SOWS

1. { Corn 40 lbs.
Ground rye 30 "
Molasses 20 "
Digester tankage 10 "
2. Corn and digester tankage in self-feeder

Keep fresh water and the mineral mixture (p. 140) before all animals at all times. For hand feeding mix the grains into a thick slop and give as much as the animals will clean up with relish twice daily. Weanling pigs may be fed 3 and even 4 times per day to advantage. Do not mix the various feeds supplied in a self-feeder; place them in separate compartments of the hopper.

Forage crops. It has been proved that pig growth and gains can be made more profitably on forage crops than in any other manner. Forage crops also simplify the sanitation problem and build up healthy, vigorous pigs with good frames and feeding qualities. In the order of their importance for swine feeding, they may be listed as follows: Alfalfa, Dwarf Essex rape, sweet clover, red clover, oats and Canada field peas, soy beans and combination mixtures of the above. All of these contain considerable protein, especially when young, are very palatable and, supplemented with such feeds as corn, rye, hominy meal, middlings and tankage, create ideal feeding conditions. Useful forage crop seeding mixtures (for an acre) are:

1.	Alfalfa	30 lbs.							
2.	Dwarf Essex rape	8 "	5.	{ Dwarf Essex rape	6 lbs.				
	Oats	30 "		{ Sweet clover	18 "				
	Canada field peas	30 "		{ Oats	30 "				
3.	Dwarf Essex rape	5 "	6.	{ Dwarf Essex rape	5 "				
	Sweet clover	10 "		{ Red clover	6 "				
	Dwarf Essex rape	5 "	7.	{ Alsike clover	6 "				
4.	Sweet clover	10 "		{ Sweet clover	15 "				
	Soy beans	1 bu.	8.	{ Soy beans	1½ bu.				
				{ Dwarf Essex rape	6 lbs.				
				{ Red clover	12 "				

Excepting alfalfa, and mixtures containing soy beans, these may be seeded in early spring. Pigs may be turned in when the plants average 8 to 10 inches in height but never let them eat the crop too closely. If the season is unfavorable and the forage limited, self-feeders containing corn, hominy meal, ground rye, and tankage should supplement

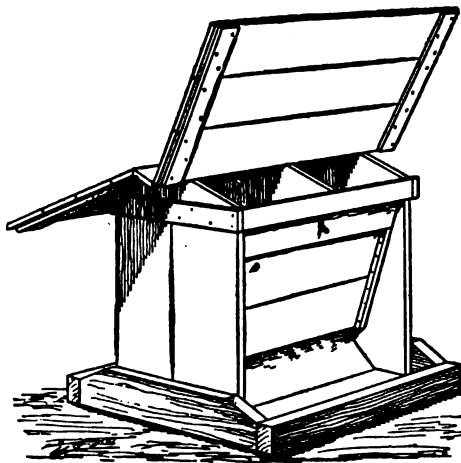


Fig. 146. A practical wooden self-feeder that any farmer can make. The sloping partitions can be moved up and down and held at any point by means of thumb bolts so as to make the opening at the bottom large or small according to the kind of feed. (N. J. Dept. of Agriculture Bulletin.)

the green forage. Pigs gain more rapidly and at the same time consume less of the green crops, when self-feeders are used in connection with forage crops. Alfalfa may be safely pastured after the second year, and should be clipped over with the mowing machine at least twice during the season; sweet clover should be allowed to reseed once in 2 years, and should be clipped during the first year in case the pigs do not crop it down fairly close; soy beans may be seeded during May or early June and allowed to develop pods; they make excellent forage during August and September. When a mixture containing oats is used, it is well to let some of the plants head out, scatter seed, and thus provide an aftermath suitable for fall feeding. Combination forage mixtures usually give better results than any single crop. Mangel wurtzels

may be grown and stored in pits as succulent winter feed for brood sows to supplement ear corn and alfalfa.

Dairy products. In Denmark as well as in certain sections of the United States it has been found that the best grade as well as the most economical pork is produced where the grain ration is supplemented with dairy by-products. Ear corn, tankage, and either skim or buttermilk make a well balanced ration for both growing and fattening. There is some danger of feeding too much of these materials, however; but results follow when 5 pounds of milk are allowed for each pound of grain consumed. Feed the milk as a drink, not mixed with the grain. Unless it can be obtained sweet at all times, skimmilk should be soured or curdled and fed in this form every day.

Worms. Lack of vigor and thrift is often due to worms. For descriptions of the different kinds, symptoms, and methods of treatment, see page 336.

Marking. Perhaps the best method of identifying each purebred litter (so that if the pigs are to be sold as breeders they may be registered) is to notch the ears. This may be done with the Dana or common leather punch, does not seriously disfigure the ear and is permanent. All of the pigs of a litter should receive the same mark even though intended for market, for in this way the herdsman can trace the parentage of the pigs that make the best gains, and thus carry over only his most useful breeding stock.

Castration. Male pigs intended for market purposes should be castrated while nursing the dam, preferably when 4 or 5 weeks old, not much later. Entire males in a fattening herd annoy the other animals and do not gain satisfactorily.

Dipping. Crude oil is the best germ and insect destroyer for hogs. Whenever lice annoy pigs fill the dipping-tank or trough with water containing a 5 per cent solution of a reliable coal-tar disinfectant, pour crude oil on the surface of this mixture, and run them through it seeing that they go completely under at least once. If the dipping-tank is not practicable small pigs may be dipped in barrels containing the same preparation. Old sows and large breeding boars may be treated with a spray pump, or the pig may be penned and rubbed all over with cotton waste or rags saturated with crude oil.

Repeat any of these treatments in 7 days to destroy any new arrivals. Several patent oilers are on the market, but they are less efficient than the dipping tanks since in many cases they merely chase the lice from one part of the pig's body to another, instead of destroying them and their eggs or nits.

Cholera prevention (see Chapter 35). If pigs are to be vaccinated against hog cholera it should be done while they are young, say 10 weeks old, when, under average conditions, they will have been weaned and on solid feed for 2 weeks. The double treatment will give immunity. No breeder can afford to run the risk of having his herd hit by the disease, that results when he puts off vaccinating. Most pigs come safely to weaning time, especially if nursing immune sows, but if there is any chance that they will not, they can be given light doses of serum (5 to 10 c. c.) to protect them until the double treatment can be given.

Marketing. Buyers do not like excessive weight; carcasses that dress from 175 to 225 pounds are most popular and bring the highest prices, but one can often build up a special

central West is simpler since there are many local buyers who assemble live animals at local stock yards and ship them in carload lots to the packing houses.

Costs and possible profits. Under average farm conditions 1 acre of blue grass pasture or any other selected forage crop will provide 25 hogs weighing 100 pounds each with succulence throughout the growing season. Ten brood sows will produce about one carload (70 head) of marketable pigs each year. An average of 7 pigs to the litter is possible

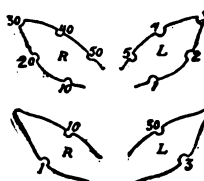


FIG. 148. Two ear-notching systems for numbering pigs for breeding records. In the lower system 55 would call for 2 notches in the top and bottom of the right ear, and one in the top and bottom of the left ear.

under average conditions, while mature brood sows can be relied upon to produce 2 litters each year. There is considerably more profit in spring pigs than in fall pigs since it costs a great deal more to fatten hogs during the winter months. Assuming that 10 brood sows can be purchased when 1 year old, safely settled to a purebred male, at a cost of \$65 each, the initial cost is \$650. Providing each of these sows yield a litter of spring pigs, and that half of them are rebred for fall litters, one may reasonably expect to market 100 head of fat hogs. Such animals, grown and developed largely on forage crops supplemented by 250 pounds of grain (corn) should yield 100 pounds of pork each. If they are marketed at 250 pounds live weight, and the prevailing market price is 10 cents per pound, the gross income would be \$25, and the net profit \$7.50 per animal. This represents what may be expected under average conditions providing disease and other difficulties are not encountered, and that the

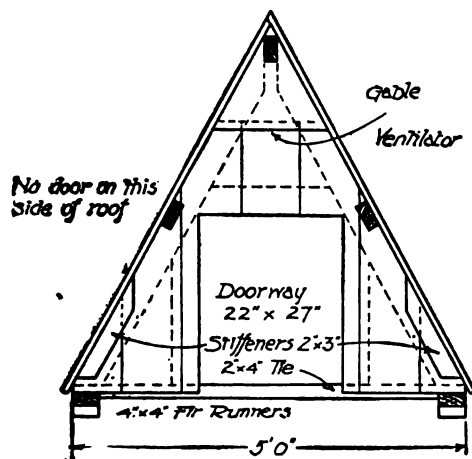


FIG. 147. Front elevation of "Economy" colony house shown in Fig. 139. (Ia. Bulletin 152)

trade in suckling pigs or roasters and in certain markets there is an increasing demand for live hogs weighing from 90 to 125 pounds. Uniformity in weight, age, color, and type add to the selling price; signs that the pigs have been grain-fed rather than slop-fed also lead buyers to pay top prices, since the flesh of garbage-fed hogs is apt to be oily, salvy, and often will not cool readily and firmly. There is a great advantage especially in the East in slaughtering and home curing pork products (Chapter 46) for local consumption which often means special high class trade. The market problem in the corn belt and the

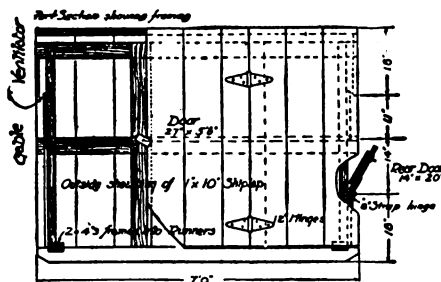
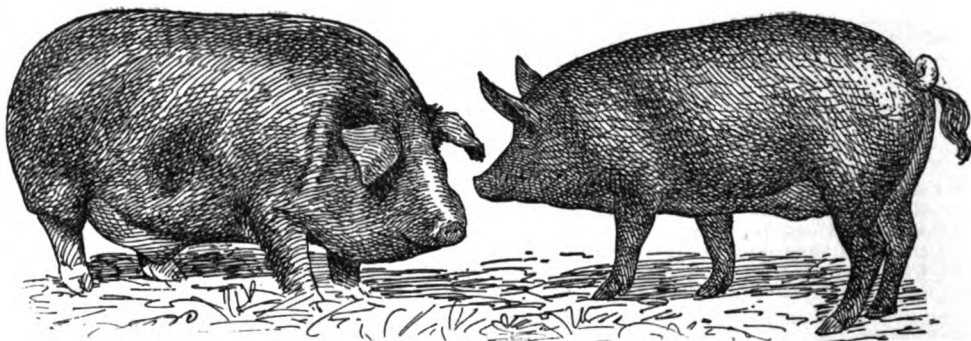


FIG. 149. Section of "Economy" colony house (Ia. Bulletin 152). For other types of houses see Vol. III

farmer raises most of the grain feed required. The value of and profits from purebred animals vary according to their age, breeding, individual merit, condition, and popularity.



Representative lard and bacon types of swine, showing differences in form and development

CHAPTER 14

Types and Breeds of Swine

Prepared by the Editors on the basis of material supplied by PROF. C. W. BURKETT, Editor of the "American Agriculturist," and of standard modern text books which summarize the results of experiment and the opinions of practical growers.—EDITOR.

SWINE owe the tremendously important place they occupy in agriculture, especially in thickly populated countries and sections, to certain qualities in which they differ from or surpass all other domestic animals. These are: (1) Rapid reproduction, resulting from large litters and a gestation period of about 115 days which, with care, makes possible 2 litters a year. (2) Rapid growth and maturity to a thoroughly desirable market condition. (3) Smallest consumption of feed per pound of gain of any farm animal. (4) High dressing percentage of carcass and value of practically all by-products. (5) Ability to consume farm products and wastes entirely useless for other purposes. (6) Low cost of individual animals, requiring but a small investment in entering the hog business. (7) Ready marketability at any age or weight.

The hog consumes less feed in proportion to what it returns than any other meat-making animal. This is due partly to its excellent digestive apparatus, partly to the variety and kinds of feed it relishes, and partly to the fact that it wastes less feed in maintaining its body heat and performing its regular labors of life than other stock. On the basis of 1,000 pounds live weight, the hog uses per week approximately 275 pounds of dry feed matter, to 160 used by sheep and 125 by a steer. Of this it will digest 230 pounds, while the sheep will digest but 120 pounds and the steer but 88. However, to produce 100 pounds of increase the steer will consume 1,100 pounds of dry matter, the sheep 910, and the hog 420. If, then, we say that in the steer the increase in live weight in proportion to food consumed is 1, in sheep it will be 1.5, and in hogs 5.8. Thus in proportion to its weight, the sheep eats more food than the steer and yields a greater increase in consequence, while the pig, by eating more heartily, consumes more food and yields greater increase than either.

These qualities, together with the finish attained by modern swine and their normally quiet, tractable dispositions are, of course, largely the result of domestication and the exercise of man's skill as a breeder upon characteristics native to the wild types or ancestors of the modern hog. The original swine ancestor

was coarse, rough, fleet, and a vicious fighter; it had its haunts in the remote, moister, forested regions of Europe, Asia, and Africa; its food consisted of plants, fruits, and roots, but in time of need it ate worms, snakes, or any kind of flesh. Some of these early characteristics, or traces of them, remain. Some of these wild forms, such as the wild boar, peccary, etc., are still found in undeveloped regions of temperate and warm countries, suggesting that the species has always been widely distributed. Also, in some cases, improved types have "gone back" into a state of nature when left to shift for themselves, like the Razorback (p. 150). It seems probable, however, that Asia first saw the domestication of swine, even though religious beliefs have prevented its use as food in several Asiatic countries. Probably, too, the Chinese breed, including a black and a white type, played a larger part than any other one form in the development of modern breeds. Its greatest influence was exerted in refining the original coarse British swine and increasing its ability to fatten.

The hog of to-day includes two distinct types, one developed and most important in England and Europe; the other a product of, and a vital factor in, the corn belt of the United States. Because the European market puts lean bacon ahead of all other pork products, and because corn—the greatest of fattening foods—is not grown to any extent there, the former is the true *bacon type*. Because of the American preference for fat bacon and large hams, the importance of lard in our cooking methods, and the wide cultivation of corn, the American hog represents the extreme *lard type*. Some breeds show enough blending of the characteristics of each to warrant the use of the term *intermediate type*.

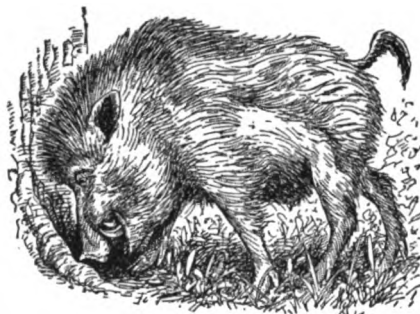


FIG. 150. A wild boar. It is from such an animal that the modern hog has developed

AVERAGE WEIGHTS OF IMPORTANT BREEDS OF SWINE AT DIFFERENT AGES
(COMPILED BY WM. HYSLOP, ANIMAL HUSBANDMAN, WASHINGTON EXPERIMENT STATION)

BREEDS	SEX	6 MONTHS	1 YEAR	2 YEARS AND OVER
Berkshire. . . . {	Boar	165 lbs.	330 lbs.	575 lbs.
	Sow	155 "	310 "	490 "
Chester White . . {	Boar	150 "	325 "	525 "
	Sow	150 "	300 "	450 "
Duroc-Jersey. . . {	Boar	170 "	335 "	600 "
	Sow	160 "	315 "	510 "
Poland China . . {	Boar	165 "	340 "	600 "
	Sow	155 "	320 "	500 "

The bacon type. The important bacon breeds belong in the large class, but as too much fat is as bad as under development, the approved market weight is about 200 pounds. The body is long, smooth, flat-sided and trim in the belly though plenty deep and wide to insure constitution and capacity. The ham is tapering, the legs are fairly long and strong and the bone is heavy though

NAME	PURPOSE	SIZE AVERAGE WEIGHT BOARS—SOWS	COLOR	ORIGIN	CHARACTERISTICS
Berkshire	Lard	Medium 575—490	Solid black with white points	South central England	Erect ears; moderately dished face; relatively straight topline; good feet and legs
Cheshire	Lard	Medium 600—400	White	Jefferson Co., New York	Resembles Berkshire in head; straight topline (for large hog); rather poor grazing and maturing qualities
Chester White	Lard	Medium 525—450	White	Pennsylvania and Ohio	Straightsnout; drooping ears; tendency to weak pasterns and poor feet. Most prolific of all lard breeds
Duroc-Jersey	Lard	Medium 600—510	Red (Light to dark)	North Atlantic United States	Between Berkshire and Poland-China in general appearance; very prolific
Essex	Lard	Small 275—250	Black	Southeast Eng- land	Small size; rapid fat- tening qualities
Hampshire or Thin Rind	Interme- diate	Medium 500—300	Black with white girdle		Color markings; straight face
Large York- shire or Large White	Bacon	Large 600—500	White	Yorkshire Eng- land	Large size; long lean body; deep flat sides; strong jaw
Mule Foot	Interme- diate	Medium 500—450	Solid black or black with white points	Arkansas	Single toed or "mule- like" foot
Poland-China	Lard	Medium 600—500	Solid black with white points	South west Ohio	Drooping ears; rounded contours and arching back; <i>early maturity</i> ; rapid storing up of fat
Small York- shire or Small White	Lard	Small 225—180	White	Yorkshire, Eng- land	Very small size; ex- tremely dished face; heavy fat jowl and very fat body
Suffolk	Lard	Small 250—200	White	England	Resembles Small Yorkshire; slightly larger and face less dished
Tamworth	Bacon	Large 600—450	Red	Central Eng- land	Large size; long snout and head; long, lean body; active disposition
Victoria	Lard	Medium 600—450	White	Indiana	Large litters; relative freedom from skin troubles

dense. The shoulder, neck, and jowl are rather light, the back not too broad, and slightly arched, and the flesh smooth, firm, and without wrinkles on the skin. Quality, as shown by a fine, smooth coat, and a vigorous, thrifty condition are naturally essential. The whole effect should be of a firm, meaty carcass, with the side as the most important and most highly developed part.

The lard type. As most American farmers know, the ideal lard hog is practically a healthy, evenly developed "mountain of meat and fat." Roundness, compactness, breadth, depth and fullness of form, fineness but cleanness of bone, even distribution of tender flesh, mellow smoothness of skin and fine soft hair are its distinguishing characteristics. The hams, back, and shoulders are the parts in which greatest development is desired, but the jowl, neck, loin, rump, and all other regions should show thorough development, smoothness and a high degree of fatness. The ability to put on weight very rapidly is naturally associated with the intensive feedlot and restricted pasture lot methods of the corn belt; so also are a less active disposition and, especially in the larger animals, a poorer foraging ability than displayed by those of the bacon type.

While swine form the main live stock feature on some farms, they are usually combined with other activities as consumers of by-products. Where steers are fattened, they make excellent gains on grain recovered from the droppings and which, undigested by the cattle, would otherwise go to waste; on dairy farms they offer the best possible means for turning skim milk, buttermilk, etc., into cash; on fruit and vegetable farms they consume practically all waste materials; and on general farms they hog down different crops, saving the trouble of harvesting, root up and destroy many weed pests, utilize unsalable forage crops and greatly improve the manure supply by working it over and hastening its rotting with the least loss from "burning."

As in any live stock business, success in hog raising requires that the beginner start on a small scale, and that, once established, he stick to the business and not jump in and out suddenly and often; he should constantly keep informed as to market conditions and tendencies; he should aim to always keep enough hogs but never too many for the size of his farm; and he should strive to be ready to sell when prices are high and buy when business depressions or other conditions hold them down. Such a system will prove swine to be one of the most profitable of all farm assets.

Breeds of Swine

Berkshire. This, one of the three most popular breeds in America, was developed in south central England by crossing Chinese upon native pigs. Wide adaptability to environment, excellence as a feeder and grazer, prolificacy and uniformity of type have gained for it much favor and a very general distribution. The characteristic Berkshire color is black with 6 white points—that is, on face, tail and all four feet. The face is of medium length, moderately dishd, and the ears are erect and of medium size. In size and conformation the modern American Berkshire represents nearly all that can be expected of a large hog of the lard type; in England there has been some development along intermediate lines with longer, flatter sides, etc. Great prepotency has long been a strong Berkshire character, and has been largely taken advantage of with splendid success in crossing for the improvement of other breeds. Sym-

metry of outline, style, finish, and strength of bone have thus been impressed upon great numbers of grade animals. As an early maturing breed it ranks high though perhaps below the Poland China, Duroc-Jersey and Chester White. It finds favor both for intensive feed lot development and ranging, and its color renders it better suited to southern climatic conditions than any of the white breeds. It is easily foremost in the eyes of wealthy breeders and country estate owners as contrasted with practical farmers and commercial pork producers.

American Berkshire Association, Springfield, Ill.

Cheshire. A breed developed in Jefferson County, New York, and limited both as to popularity and distribution to eastern United States. The straight or slightly dishd face and erect or forward pointing ears remind one of the Berkshire, but in its long straight back

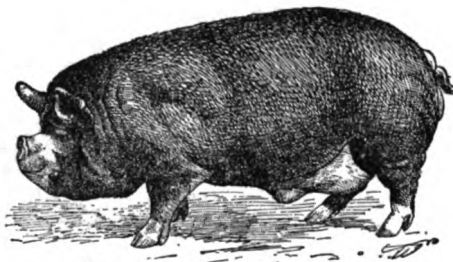


FIG. 151. A champion Berkshire boar

it differs from any other medium heavy breed. The quality of meat and development of shoulders and hams are considered very desirable, but the Cheshire is not an especially easy or economical fattener, is only a fair grazer, often lacks depth, and tends to have weak pasterns and feet.

Cheshire Swine Breeders' Association, Freeville, N. Y.

Chester White. This white breed was originated in Chester County, Pennsylvania, by crossing English and Chinese stock with native white swine. Later improvements in Ohio are credited to Mr. L. B. Silver who established a uniform type of large size and superior quality, known as the Ohio Improved Chester White or "O. I. C."

The breed may still be called large, although because of the increasing demand for medium weight hogs of great refinement and quality, it is smaller than it formerly was. It matures early and fattens rapidly and economically, utilizing either pasture or grain in a highly satisfactory manner. As a prolific breeder it is considered superior to all other heavy-fleshed breeds. The snout is usually straight and the ears droop forward. Common grounds for criticism are weak pastern, low dewclaws and toes too much bent and spread to sustain the animal's weight. A tendency (common to the thin skin of all white breeds), to sun scald and become scurfy when exposed to hot sun and dry weather is also criticized. On the whole, however, the breed is not only holding its own, but gaining in popularity.

Chester White Record Association, Rochester, Ind.

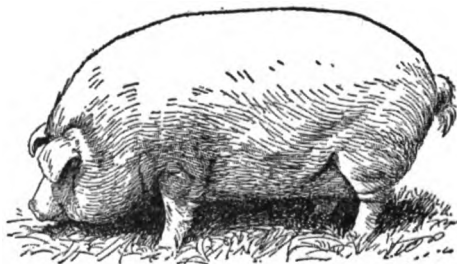


FIG. 152. A typical Chester White

National Chester White Record Association, West Chester, Pa.

O. I. C. Swine Breeders' Association, Cleveland, O.

Duroc-Jersey. A large red breed of the lard type, developed in northeastern United States as the result of the combination of several types of red swine no longer represented among our improved breeds. In size it ranks with the Berkshire and Poland-China and in conformation and general appearance it ranges between the two. The head is small, the face almost straight, the ears drooping and of medium size, the back broad and slightly arched, the ribs well sprung, and the legs short and well boned. This breed matures early, grazes well, and outranks all other lard breeds in size of litters—no doubt the strongest points in its favor. It is easily the most popular breed in the corn belt and perhaps among practical farmers in other sections.

American Duroc-Jersey Swine Breeders' Association, Chicago, Ill.

National Duroc-Jersey Record Association, Peoria, Ill.

Essex. A small, solid black breed from

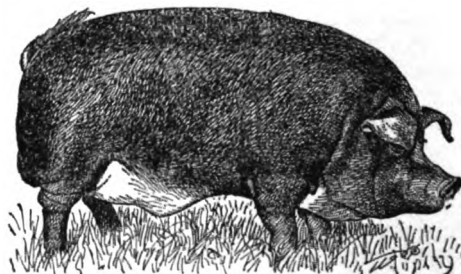


FIG. 153. An outstanding Duroc-Jersey sire

eastern England. It has long been known and bred on small farms where early maturing swine capable of economically producing fat pork are wanted. The head is short, the face slightly dished, and the ears small, fine, and erect. The form tends more toward the fat, chunky type than that of any other English breed except the Small Yorkshire. Overfat meat and small litters are grounds for criticism in the United States where the breed is not well known except in parts of the South.

American Essex Association, McLean, Ill.

Hampshire or Thin Rind. This breed is easily recognized by a broad belt of white girdling an otherwise black body and taking in the forequarters; the effect is much the same as in Dutch Belted cattle (p. 81). The origin of the Hampshire is uncertain, but probably traces to an English breed of that name. In the United States it is found mainly in Kentucky, though small herds also occur in Illinois and Indiana. It is a typical intermediate class hog; produces meat of excellent quality; is a very good grazer and

forager, and is more prolific than any other American breed, litters of 10 to 12 pigs being common.

American Hampshire Swine Record Association, Peoria, Ill.

Large Yorkshire or Large White. This breed is native to Yorkshire, England, where it has long been bred to meet the English demand for lean bacon. It is the largest of all hogs; solid white in color; and one of the two strictly bacon breeds, the Tamworth (p. 150) being the other. In England a smaller Middle York or Middle White breed is recognized, but the type is hardly fixed and is practically unknown in the United States.

In appearance it is large, long bodied and upstanding; the head is medium long and only slightly dishd; the under jaw is broad and strong; and the ears, of medium size, point forward. Its European distribution has been general, but in the United States, where the market demand is strongest for a medium weight, fat hog of the lard type, it has met with

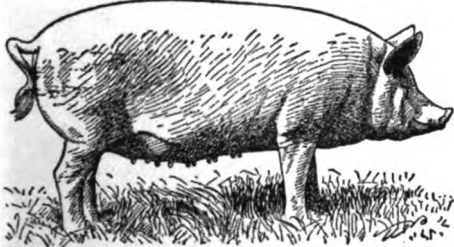


FIG. 154. Yorkshire or Large White sow

little favor; slow maturity, a large, long, and narrow body with poor fattening qualities, and, to a certain extent, the white color have all served as drawbacks. Large litters are perhaps its strongest claim for favor in this country, 10 to 12 or more pigs being common. By crossing the Large York on the Small Yorkshire or some other lard breeds, large litters of very desirable pigs are obtained.

American Yorkshire Club, White Bear Lake, Minn.

Mule Foot. A breed characterized by a solid hoof like that of the mule instead of the cloven or two-toed foot of other swine, developed in Arkansas, probably from a Berkshire-Razorback cross. Like the Hampshire, which it somewhat resembles in form, it belongs to the intermediate class. Either solid black or black with white points is accepted as true to type; weights range from 450 to 500 pounds. Immunity to hog cholera has been claimed for the Mule Foot, but convincing proof of such resistance is wanting.

National Mule Foot Hog Registry Association, Indianapolis, Ind.

Poland-China. This breed, of the strictly lard type, contends with the Berkshire and Duroc-Jersey for the title of most popular breed in America. It was developed in Butler and War-

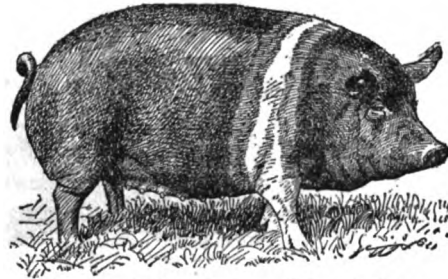


FIG. 155. A Hampshire sow of the right type

ren counties in southwestern Ohio, and thence has been distributed over most of the United States. It is most numerous, however, and most popular in the "corn belt," where also it reaches its highest development and greatest perfection. It closely resembles the Berkshire in size and color, but differs from it in having a straight face, drooping ears, a more arched top line and a more rounded rump. The back is broad, well covered and of medium length; the sides are rather short but very deep; and the hams large and of exceptional quality. The legs are noticeably short and often show excessive refinement of bone, weak pasterns, and poor feet. Especially strong points of the breed are early maturity, economical utilization of feed, and large and rapid meat production. Though it bears smaller litters than the other lard breeds, it retains its popularity as a hog adapted to feedlot conditions.

American Poland-China Record Association, Chicago, Ill.

Standard Poland-China Record Association, Maryland, Mo.

National Poland-China Record Company, Winchester, Ind.

Razorback. Not an improved breed, but, on the other hand, a run down type descended from hogs introduced into the country by early settlers, and allowed to run wild. Generations of wild life and constant rustling for feed transformed its nature and characteristics into those of its original ancestors—as found to-day in the wild boar of Europe, namely, long snout and tusks, thick skin, long bristles, narrow back, small hams, and

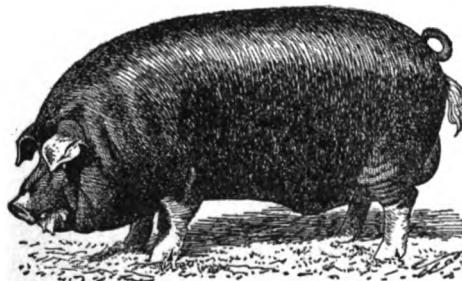


FIG. 156. A Poland-China boar, typical of corn-belt size, quality, and conformation

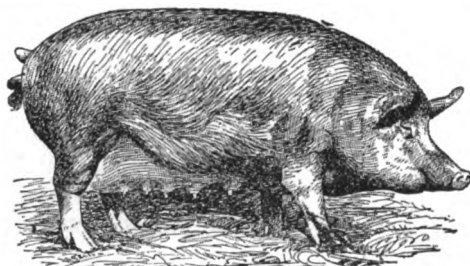


FIG. 157. A Tamworth sow of typical bacon type.

long legs, wildness, poor feeding qualities, speed, endurance, and fine fighting ability. With nothing but its hardiness and vigor to recommend it, it is rapidly disappearing before the advance of the improved breeds, although still found in the forested lowlands and cane brakes of the South; its part in the American swine industry and its importance are, like those of the Texas steer (p. 79), rapidly becoming merely historical memories.

Small Yorkshire. This, the smallest of the strictly lard breeds, is little known in the United States; even in England, where it was developed, it is not in great favor. Though an early maturing, economical feeder, it fails to meet English market demands for pork because of its extremely fat meat; its small size makes it a poor competitor against the popular breeds in this country. Small York characteristics are the white color; short dished face; upturned lower jaw; short, erect ears; round, heavy jowls; and broad, deep, compact body.

United States Small Yorkshire Association, California, Mich.

Improved Small Yorkshire Club of America, Espeyville, Pa.

Suffolk. This name is given to two breeds, one in America and one in England. The English Suffolk is black and has already been described as the Essex (p. 148) by which name it is known in the United States. The American Suffolk is a small white breed closely resembling the Small Yorkshire (from which it was no doubt derived) except in its somewhat less dished face and slightly larger size. There is no breed association and the breed is little if at all known outside small sections of Michigan, Iowa, Illinois, and Indiana.

Tamworth. A large, long legged, active breed of the extreme bacon type native to central England, but raised only to a limited extent in the United States, Canada, and even in Great Britain. In size it almost equals the Large Yorkshire, but it is rougher, more rangy and less refined in appearance. The head is large, the neck and shoulders very muscular, the snout long, straight, and powerful, the ears large and erect, the body long, lean, and "slabsided," and the legs long, clean, and strong. Like the Large Yorkshire, the Tamworth produces excellent bacon, large litters of pigs, and is rather slow in maturing, but its restless, active temperament makes it a better rustler. It is also especially noted for its hardiness.

American Tamworth Swine Record Association, Hamburg, Mich.

Victoria. This white breed was developed, probably in Indiana, by combining Berkshire, Poland-China, Chester White, and Suffolk blood. In size it classes with the Berkshire, but as a feeder in comparison with the better known breeds, it will hardly rank so high. Large litters are claimed as a Victoria characteristic and it is said to be much less susceptible to sunburn, mange, etc., than other white breeds. The breed is not well known, is seldom seen in the show ring, and as far as distribution is concerned, is practically restricted to parts of Indiana, Ohio, and Illinois.

Victoria Swine Breeders' Association, Dyer, Ind.

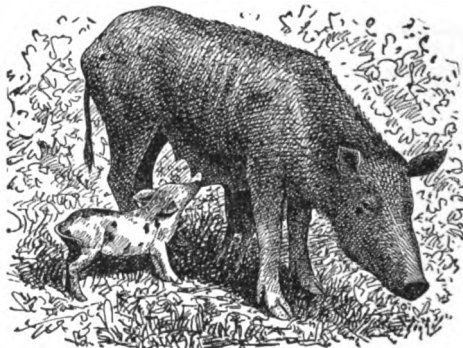


FIG. 158. A "Razorback,"—the kind of hog it doesn't pay to raise

United States Swine Industry Statistics

Unlike cattle, sheep, and horses, swine follow rather than go in advance of intensive farming. In their present improved form they are not grazing animals in the sense that they can range over rough, open country, gather their feed as they go and settle down at night wherever they find themselves. The leading countries in swine raising according to (1) number of hogs, (2) number per 1,000 population, and (3) number per square mile are:

LEADING COUNTRIES IN SWINE PRODUCTION

COUNTRY	NUMBER	PER CENT OF TOTAL	COUNTRIES ARRANGED IN ORDER OF	
			NO. SWINE PER 1,000 POPULATION	NO. SWINE PER SQUARE MILE
United States . . .	60,000,000	37	Denmark	Denmark
Germany	26,000,000	16	United States	Belgium
Russia	16,000,000	10	Venezuela	Germany
Austria	14,000,000	9	Colombia	Netherlands
France	7,000,000	4	Canada	Austria
Great Britain . . .	3,500,000	2+	Argentina	Serbia
Canada	3,000,000	2—	Germany	Porto Rico
Argentina	2,500,000	1.5	Austria	France
The World . . .	162,800,000	100		

The distribution of the world's swine are pictured in Fig. 159. It will be noted that they follow in general the regions of intensive agriculture and abundant products such as corn, barley, potatoes, and dairy by-products. They are undoubtedly numerous in China but neither data nor estimates of their numbers there are possible. As mentioned, the United States—the home of corn—is the centre of fat hog production and England, Ireland, and Denmark where potatoes and dairy products are more important, are the main bacon producing sections.

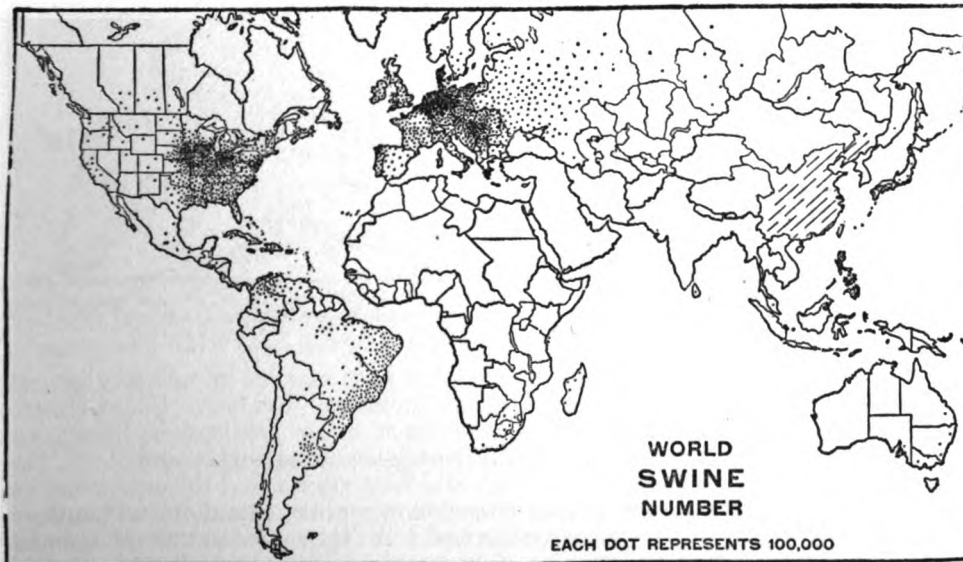


FIG. 159. Improved swine and improved, intensive farming methods go together. The United States has nearly one third of all the hogs in the world, but per 1,000 population and per square mile it has less than several countries of Europe. (1916 Yearbook, U. S. Department of Agriculture).

SWINE IN THE UNITED STATES

YEAR	NUMBER	VALUE PER HEAD	FARM VALUE
1867	24,694,000	\$ 4.03	\$ 99,637,000
1870	26,751,000	5.80	155,108,000
1870*	25,134,569	.....	.....
1880	34,034,000	4.28	145,782,000
1880*	47,681,700	.....	.....
1890	51,603,000	4.72	243,418,000
1890*	57,409,583	.....	.....
1901	56,982,000	6.20	353,012,000
1910*	58,185,676	9.17	533,309,000
1912	65,410,000	8.00	523,328,000
1915	64,618,000	9.87	637,479,000
1918	70,978,000	19.54	1,387,261,000
1919	75,587,000	22.00	1,665,987,000

*Actual figures from census returns. Others are Department of Agriculture estimates.

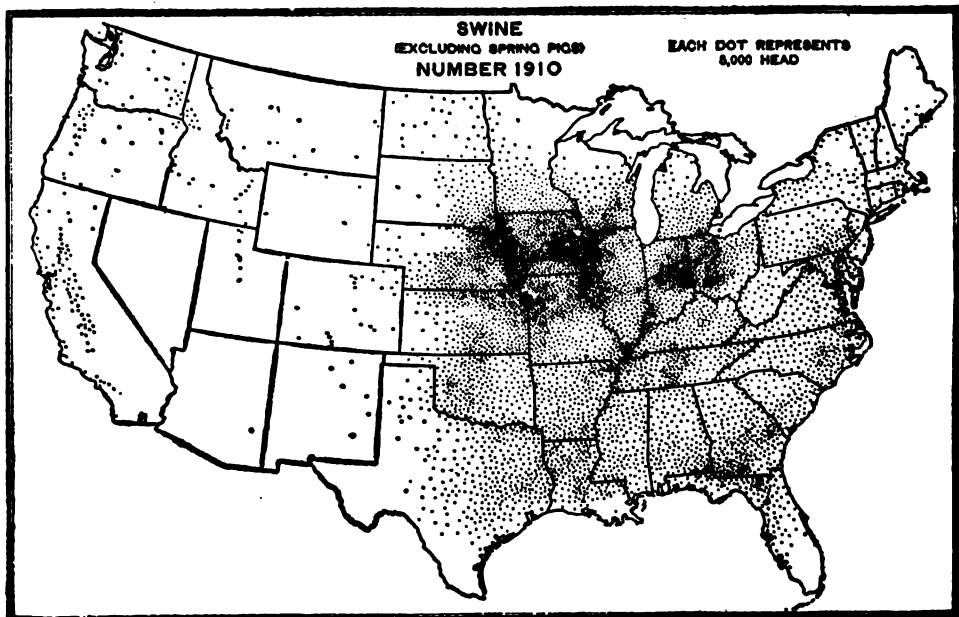


FIG. 160. Swine may be profitably raised on practically any kind of farm where there are crop or dairy by-products. In beef production, hogs as a side issue often mean the difference between profit and loss. (1915 Yearbook, U. S. Department of Agriculture).

In the United States the swine industry has been marked by a steady general increase in numbers and, since about 1895, a rapid rise in values. From time to time epidemics of hog cholera (Chapter 35) have caused tremendous losses, but modern science and knowledge are finding means to lessen this danger. In view of the increases in population, feed prices, and land values, and the continual demand for meat products there is every reason to expect the extent and importance of the swine industry to continue unchecked. A further indication of this importance is supplied by the following data from the U. S. Department of Agriculture Yearbook for 1918 on the country's trade in pork products:

SWINE PRODUCTS 1917

	EXPORTED		IMPORTED	
	AMOUNT	VALUE	AMOUNT	VALUE
Cured products, pounds	980,813,263	\$174,637,910	190,975	\$ 46,668
Fresh " "	50,429,275	8,875,013	1,651,227	280,795
Lard " "	444,787,521	77,012,880		
Lard oil (gallons)	881,269	322,813		
Total value		\$265,658,343		

The ranking of the states as shown in Fig. 160 and in the following table bears out the statements already made as to the connection between hogs and the corn belt:

STATE	NUMBER JAN. 1, 1919	AV. PRICE PER HEAD	STATE	NUMBER JAN. 1, 1919	AV. PRICE PER HEAD
Iowa	10,925,000	\$27.50	Georgia	3,043,000	\$17.50
Illinois	5,724,000	25.00	Minnesota	2,784,000	28.50
Missouri	4,943,000	18.50	Kansas	2,381,000	21.50
Indiana	4,668,000	23.30	Texas	2,320,000	17.00
Ohio	4,266,000	21.80	Mississippi	2,282,000	16.00
Nebraska	4,250,000	26.50	Alabama	2,223,000	17.00





FIG. 161. The large breeds are not house dogs, but include some of the best guards and companions, *a*-Great Dane; *b* Newfoundland; *c* St. Bernard; *d* Bloodhound; *e* Mastiff

SECTION FIVE

OTHER FARM ANIMALS

CHAPTER 15

The Dog on the Farm

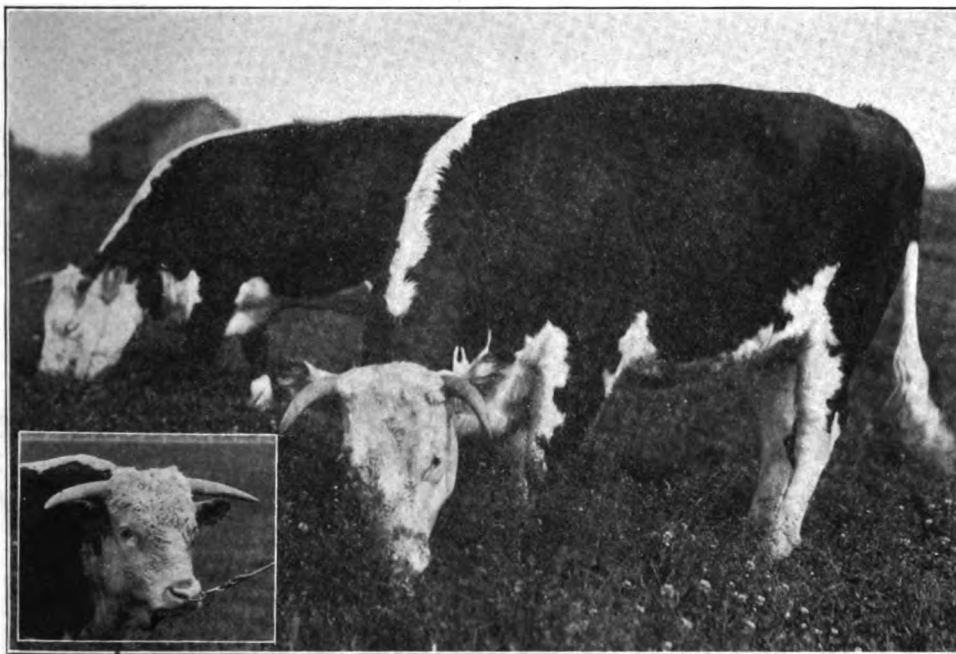
By WALTER A. DYER, a farmer who likes dogs, understands them and knows how to raise them and how to write about them. He is in charge of the dog department of "The New Country Life" and is constantly giving helpful advice to people who want to know how to buy, sell, raise, breed, and care for dogs of all kinds.—EDITOR.

NINE people out of ten like dogs, but there are still a good many who don't. Many farmers, especially sheep raisers, think it would be a fine thing if no such animal existed. After all, whether a dog shall be a blessing or a curse depends largely on its training. A sheep or other farm is no place for stray or untrained dogs, but on the other hand nowhere can a good, intelligent, trained dog be more useful. There are many ways in which he can earn his board and more if properly trained and handled, and many cases are on record of dogs gladly rendering heroic and invaluable service, even at the cost of their lives. In Europe dogs are used to haul carts and do other light draft work, but in this country, except in Canada, Alaska, etc., where dog sledges are used, this is not a common practice. In fact in some states it is against the law. With the increased use of small engines the dog is being less used to run treadmills for operating churns, etc., but there are still a number of ways in which he can be really useful on the average American farm.

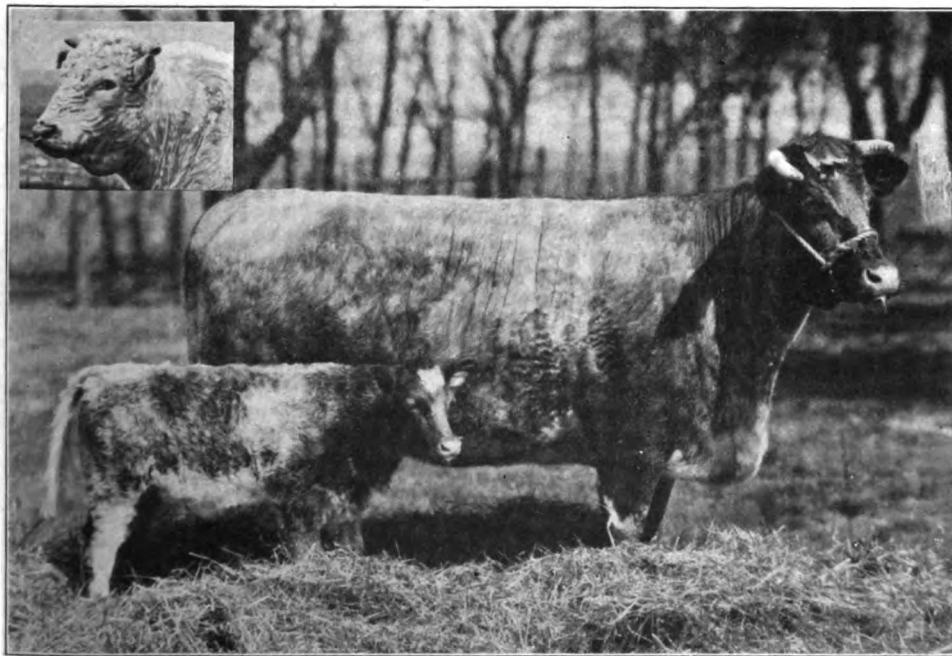
As a guard. Dogs have long been used to guard and protect people and property, and the instinct to do this seems to run in their blood. The well trained house or watch dog will not accept the attentions of strangers and will keep away tramps and other intruders. He need not be fierce or dangerous; dogs very soon learn the difference between friend and foe, and are quiet and harmless toward members of the family, and people who come to the house on proper business. The good watch dog usually relies on his

bark but never hesitates when courage and action are called for. He will protect women and children especially, and seems to realize that the helpless are his special care. Dogs may also be trained to take care of the house when the family is away, or to guard property wherever it may be. A good watch dog is, in fact, almost essential in a lonely farmhouse as a companion no less than as a protection.

For handling stock. Dogs are often useful in helping to drive or fetch cattle, and are sometimes trained to do this alone and save



**The Hereford, red with white face and top line, a typical beef animal,
unexcelled for range fattening**

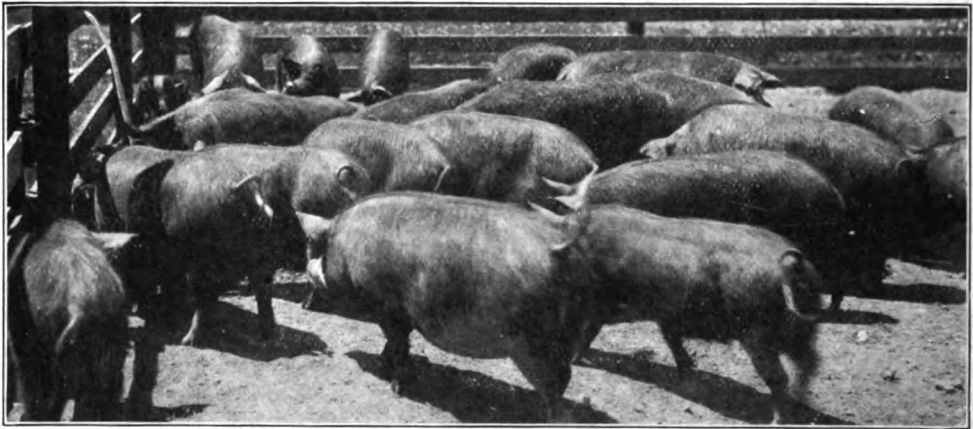


The Shorthorn, unique in its roan color; an all-round, thoroughly established beef breed

THE LEADING BEEF BREEDS—II



Range-fed beef, less important than formerly because of the cutting down of the range territory



Feed-lot swine, one of the most economical and profitable forms in which to market farm crops



Feed-lot cattle, the last word in high quality meat production

THREE SOURCES OF MEAT FOR THE NATION

the time of a man or boy. Of course an untrained dog is worse than none, worrying and exciting the stock and making it harder to manage. For driving and guarding sheep, dogs have been used for centuries, some breeds appearing to have an instinct for this work.

For destroying vermin. Farmers troubled with wild pests will find the right kind of dog very valuable. He will dig for gophers, moles, and muskrats, chase rabbits off the farm, hunt and kill woodchucks, and sometimes rid the barn or granary of rats more effectively than even a cat. In states where deer hunting is illegal, deer often become numerous and tame, browsing on young fruit trees, spoiling the garden, and bothering the stock. A good dog will often keep them away.

For hunting. Men who hunt know the value of a good dog for locating birds, running rabbits and foxes and treeing raccoons and op-

possums. This work, of course, requires special training. Dogs are also used for hunting bear and other big game, but in most states it is illegal to use them for moose, deer, etc.

As a source of profit. If the farmer understands the principles of breeding, has good stock to start with, and is in a position to secure a ready market for his puppies, he may find dog raising as profitable as raising hogs or sheep. It requires special knowledge, however, and the average farmer should not go into it without first making a careful study of the subject.



FIG. 162. A lively, small dog is a great destroyer of vermin on the farm.

The Everyday Care of the Dog

The care of the farm dog need not be burdensome; in fact he is likely to keep in better shape if allowed to take care of himself to a large extent, than if pampered. But there are a few rules and details that every dog owner should learn.

Feeding. Feeding practice differs slightly according to the breed and size of the dog, but common sense and moderation are always good guides. Overfeeding as a rule is worse than underfeeding and irregularity worse than either. A dog with a good appetite, unless prevented, will eat at any time and is likely to get his digestive system out of order. If fed regularly he is less likely to pick up things that will disagree with him. One good meal daily, given toward night and at the same hour every day, is enough for a healthy grown dog of many breeds. It may consist of meat cut in small pieces, stale bread and vegetables well mixed and moistened, *not* soaked, with soup or gravy. Give only as much as he will eat up eagerly, and never leave a dish with food in it to which he can go back later. If he bolts this meal, and clearly needs more, a light breakfast of stale bread or cereal and skimmilk can be fed, and during the day a bone without much meat on it. A dog digests slowly and if fed too often will suffer from congestion of food in his stomach.

Of course table scraps will often go a long way toward feeding a dog and giving him the variety he must have. Though he is by nature carnivorous (meat eating), meat should form only the basis of his diet. When meat must be bought, shin of beef is cheap and good; the dog will eat or gnaw the bone, and the water in which it is boiled makes good gravy. A little raw meat once a week is a good tonic and fish makes a desirable change. Pork, ham, bacon, and sausage should be avoided, also too much poultry meat or fat of any kind. Above all, don't feed tainted meat, dirty food, or small bones like chicken legs that splinter and may easily cause pain, injury, and even death. Otherwise bones are good at any time, keeping him amused, polishing his teeth and aiding his digestion.

As to special foods, milk is usually good for dogs, especially growing puppies (see page 159). Any well cooked grain or cereal is valuable except cornmeal, which tends to cause skin trouble; rice, oatmeal, shredded wheat waste and stale bread are good; dog biscuits (which contain a little meat) are useful but expensive; vegetables, *except potatoes*, should form a regular part of the diet. A dog is far better off without sugar, pastry, or dainties. A little salt now and then is



FIG. 163. A homemade, packing-box kennel. In winter hang a piece of carpet or burlap over the door, in summer ventilation at the top would help.

up against its sides and keep warmer. For a bed, some long haired breeds need only a piece of sacking or old carpet. A grain bag stuffed with hay or straw is better, and neater than loose straw. Air the bed often and burn the straw every few weeks, or oftener, if the dog is sick or badly troubled with fleas. Look out for dampness, draughts, and colds.

Exercise and bathing. A dog that doesn't get enough exercise soon gets out of condition, developing indigestion, excess fat, and a bad temper, but this is not likely to happen to the farm dog that has the run of the place. If it is necessary to tie him up at night, use a good long chain so that he will be less likely to surround his bed box with filth. It is a mistake to keep any dog on a short chain all the time; it develops dirty habits and a bad disposition. If he is too savage to be given any liberty, better dispose of him. If some restraint is necessary, provide a yard; or a strong wire with a metal ring on it can be stretched between 2 posts or trees high enough to clear a man's head at the lowest point of the sag. Snap a chain about 4 yards long to the dog's collar and to the ring which will slide along the wire and give him a fair amount of freedom. Don't exercise any dog directly after his meals.

Outdoor dogs don't need bathing often, and with all dogs (the long haired sorts especially) as with horses, brushing and combing is more important than washing. At the same time dogs are not as cleanly as cats and should be kept from becoming filthy. A dog that likes to swim and that can get to water will need little if any other washing. Otherwise take him to a brook in summer, or fill a wash tub with warm water in winter and rub in a thick suds of tar or carbolic soap. Work thoroughly but quickly and after rinsing rub him *dry* before letting him run in the wind, especially in cold weather.

Breeding and whelping. To own a

helpful, and sulphur or limewater should occasionally be added to the drinking water, of which there should *always* be a plentiful, clean, fresh supply at hand.

Shelter. The farm dog needs not a fancy kennel, but merely a place to sleep where he is protected from dampness and exposure. All dogs are the better for plenty of outdoor air though some breeds stand cold better than others. A box open on part of one side, made waterproof with roofing paper, shingles or tin, with a bed in it and with the entrance protected by a curtain of burlap or carpet makes a good house. If it can be set on bricks under a shed roof facing inwards, so much the better. It should not be so small as to cramp the dog, but if it is of just the right size he will curl

up against its sides and keep warmer. For a bed, some long haired breeds need only a piece of sacking or old carpet. A grain bag stuffed with hay or straw is better, and neater than loose straw. Air the bed often and burn the straw every few weeks, or oftener, if the dog is sick or badly troubled with fleas. Look out for dampness, draughts, and colds.



FIG. 164. The Old English sheep dog, not very common in America but hardy, intelligent, and reliable.

female dog, or bitch, is not as undesirable as many suppose, especially if she is of good quality. She may be really profitable, and she is troublesome for only about 2 weeks twice a year. As a rule females are more easily handled and cleaner about the house than males, and often make fully as good farm dogs. Choose a good, full-blooded sire in every case. It is to every one's interest not to let the bitch pick a chance mate.

A bitch comes in heat with considerable regularity every 6 months beginning at from 7 to 10 months of age, according to the breed. It is well not to breed until her second heat, the best time being between the fifth and ninth days of the period. Don't try for more than one litter a year, no matter how valuable the bitch; and don't look for best results after she is 8 years old. The first 3 litters are usually the best. The gestation period is 63 days, during which the bitch should have comfortable surroundings, a warm dry place to sleep, ample but not violent exercise and a good variety of food with plenty of bones.

At about the end of the third week, for the good of the puppies, treat her for worms (page 160). On the sixtieth day, give her a mild laxative—salad oil, or if necessary, castor oil.

The healthy bitch of a hardy breed needs no human assistance in whelping and does better if left alone. Give her a clean bed and plenty of water. Soon after the puppies are born, give her a drink of warm milk, and an hour or two later, a little meat. The next day she can be fed as usual. Allow her to attend to her puppies in her own way, but if any are malformed, dispose of them at once. If the litter is unusually large, it is better to reduce it by one or two.

Care of the puppies. Keep young puppies with the mother until they are weaned; a good plan is to provide a pen from which they cannot escape, but from which she can if she desires. After they are 2 or 3 weeks old, keep them out of doors in pleasant weather. Treat for worms as directed on page 160.

Weaning may begin soon after the pups are 2 weeks old, when cow's milk should be given 3 or 4 times a day. One successful breeder gives as the first solid food wheat shreds in milk, once a day, in addition to 3 meals of milk. As soon as the pups get their teeth they get 5 meals daily—milk for breakfast, wheat shreds at 11 o'clock, milk again at 2 and at 5, and chopped raw meat with well-cooked rice at 8 in the evening. The pups may be fully weaned when 6 weeks old, but are generally left with the mother for 2 months.

"Gradually drop the milk feedings after 4 months," says this breeder,



FIG. 165. The Collie, if well trained, is probably the best of all dogs for the stock farmer



FIG. 166. The Airedale, one of the best, all-round dogs for the farm

"and at 6 months and after give a dog biscuit, or one and a half, for breakfast, a piece of dry bread or a dry bone at noon, and a hearty meal at night."

Another breeder gives dry bread soaked in milk as soon as the pups are weaned, and soon adds cereal and boiled vegetables. At 10 weeks he adds a little meat. After 3 months he feeds very little milk and more meat. To puppies 6 to 12 weeks old he gives 4 meals a day; 3 to 8 months, 3 meals; 8 to 12 months, 2 meals.

Fleas. Fleas attack all dogs, especially the long haired breeds, and chiefly in summer and fall. They make their victims nervous and cross, keep them in poor condition and cause constant scratching that may result in sores and skin trouble. A warm bath with carbolic soap will kill many, as will Persian insect powder rubbed into the coat. But the best thing is a coal tar preparation such as Creolin. Commercial cresoleum is good or you can buy at the drug store *liquor cresolin compositus U. S. P.* Use a tablespoonful to each gallon of hot water, add a little washing soda and wash the dog thoroughly. Oil of turpentine

and kerosene emulsion makes a good flea killer but it is less pleasant to use. Try also to destroy the eggs by burning the bedding frequently and thoroughly cleansing the box or kennel with tobacco solution (one-half pound tobacco shag to one quart water boiled down to one and one half pints). Follow this with hot water and soda the next day. Paraffin scraped fine and sprinkled in the house is good.



FIG. 167. The German shepherd dog is especially popular as a guard and protector, but being highly intelligent it can be taught to be useful in a number of other ways as well.

Worms. Almost every dog has worms at one time or another; puppies are most often infested, the parasites often entering their bodies almost as soon as they are born. Therefore it is well to give a puppy a mild dose of syrup of buckthorn (one-half to one teaspoonful)

at the age of 2 or 3 weeks, repeating the treatment every week or so until it is 8 months old and then 2 or 3 times a year at least, increasing the dose to keep pace with its size.

The symptoms of worms in an older dog vary but the commonest are loss of flesh, indigestion, diarrhea, constant hunger, etc. Sometimes worms cause a puppy to bloat or its skin to break out. If any such signs appear, a dose of worm medicine may fix him up and at all events it cannot hurt him. The best medicine for the common round worm is a pill or capsule containing one grain each of *santonin* and *calomel*. Give the dog a tablespoonful of castor oil at night 2 or 3 hours after his dinner to clean him out. Give him no breakfast but, in the forenoon, one pill, or two if he is very large. Three or 4 hours later give a tablespoonful of olive oil and at night the regular dinner. One dose may be enough or it may be repeated in 5 days.

Another good worm medicine for tape worm as well as other kinds is powdered areca nut made into a pill with glycerine or butter, given after a 12-hour fast and followed 2 hours later with a dose of castor oil. Give 1 to 2 grains of areca nut per pound of dog.

General Health Hints

1. If a dog seems in low spirits, weak, and feverish, and if his eyes and nose run, look out for distemper (Chapter 31). 2. If there

are skin eruptions consult a good veterinarian; they may mean mange, eczema, or some constitutional trouble. 3. If he is thin and poor, treat him for worms. 4. Don't let diarrhea or constipation run unchecked and become



FIG. 168. To give a large dog liquid medicine, pull out the loose skin of its mouth to form a funnel, pour in the dose and hold the muzzle up until it is swallowed.

chronic. For full information about dog diseases see Chapter 31.

Simple remedies.

1. For poor condition, sluggish bowels, bad blood, a sulphur and cream of tartar tablet twice a day. 2. To build up and add flesh, a tablespoonful of emulsion of cod liver oil night and morning. 3. As a general tonic, *quinine salicylate*, 2 grains each night. 4. As a tonic in cases of skin trouble, a pill, 3 times a day, made

of *quinine sulphate* one-eighth to 3 grains (according to size of dog), *iron sulphate* one half to 5 grains, *extract of hyoscyamus* one-eighth to 3 grains, *extract of taraxacum* and glycerine, enough to give the right body to the pill. 5. As a general laxative 1 to 4 teaspoonfuls of castor oil and syrup

of buckthorn equal parts. 6. General corrective, flowers of sulphur and charcoal in the food. 7. The best way to give medicine, either liquid or a pill, is to grasp the dog's nose across the top with one hand, pressing his upper lips between his back teeth with thumb and fingers, causing him to open his mouth and throw back his head, and preventing him from biting. With the other hand place the pill or liquid on the base of the tongue, as far down the throat as possible. Then close his mouth with both hands, holding his nose up until he has to swallow. If he is too big for this method or if a liquid medicine is not unpleasant to taste, pull out the loose skin at the side of his mouth to form a pocket into which the dose can be poured. As before, hold up his head until he swallows, or he may splash it all around.



FIG. 169. To dose a small dog, open the mouth as shown holding the lips over the teeth, and put the liquid, pill or powder well back on the tongue.

Special Breeds for Special Purposes

Any intelligent dog can be trained to be useful but some breeds are, by nature, better for certain uses than others.

Guards and watch dogs. The large breeds, because of their power and formidable appearance, make the best outside guards. None is better than the Great Dane, at once intelligent and powerful enough to get the better of a man. Other large dogs are the St. Bernard, the bloodhound, the mastiff, and the Newfoundland, though the last two are now rare in this country. Among the medium-sized dogs there are a number of valuable fighting breeds, notably the gentle but ugly looking English bulldog, the bull terrier, and the larger type of Airedale terrier, the latter being one of the best all-round dogs for the farm. He is a little hard to train, but can be taught to hunt, drive cattle and guard. A rather new dog in this country, but an excellent guard, is the handsome German shepherd, sometimes known as the "police dog." Almost all of the smaller terriers are alert and ready to give a warning, and some of them, like the Irish terrier, will not hesitate to attack an intruder vigorously.

Sheep and cattle dogs. The best dog for herding is the collie, the old-fashioned type of shepherd dog with a broad head being, as a rule, more useful and intelligent than the modern, narrow-headed show type. Collies are often nervous, like some of the terriers, and inclined to be troublesome, running and barking after horses, automobiles, etc., but a

good, well-trained collie, hardy, useful and intelligent, has no superior for farm work. Next in importance is the intelligent and easily trained Old English sheep dog, which is gradually becoming more common in this country. His very long coat requires some care, but he is well able to take care of himself, will stand any amount of cold and makes a good companion and guard. The German and Belgian shepherd dogs also make good herders. On a large Massachusetts stock farm German shepherd dogs have proved very valuable in locating calves dropped in the woods or brush.

Vermin killers. Nearly all the terriers are natural ratters and will help rid the farm of woodchucks, gophers, etc. The Airedale, Irish, and fox terriers are all experts at this business, while some of the less common kinds are almost equally good—the Scottish, Welsh, Sealyham, West Highland, etc. Bull terriers vary in their abilities in this direction. For larger pests, such as coyotes, the wolfhounds, which are really hunting dogs, are the best, while large Airedales will make it uncomfortable for almost any animal. To train a terrier to kill vermin, start him at the age of 6 months on mice. Let him see an older dog do the trick, and he will soon learn.

Sporting dogs. Many farmers find a little hunting pleasant and profitable, and a good dog is a great help. The chief sporting dogs are hounds, setters, and pointers,



FIG. 170. The Setter, a typical hunting dog but rather high strung for a pet or useful farm dog



FIG. 172. The Pointer, not often kept except for hunting purposes

spaniels, and some of the terriers. The best bird dogs are the setters (English or Llewellyn, Irish, and Gordon or black-and-tan); the pointers; the retrievers, (flat-coated, curly, Labrador dog and Chesapeake Bay dog); and the spaniels (field, cocker, Irish water spaniel, etc.). The English variety is the most popular setter, though the pointer is equally good wherever his short coat is not a disadvantage. Foxhounds, beagles, and harriers follow a trail by scent and are valuable for hunting rabbits, foxes, etc. Some hounds, of uncertain breeding, are especially trained



FIG. 171. The Bull Terrier has a well deserved reputation as a game fighter, but he is also an honest, staunch, good-natured friend and companion.

as rabbit or 'coon and 'possum dogs. Dogs of the speedy greyhound type, which hunt by sight not by scent, have been used for hunting wolves and coyotes in the West and in Canada, where this kind of hunting is permitted. They include the Russian wolfhound or *Borzoi*, the Irish wolfhound, and the Scottish deerhound. For bear and other big game, large Airedales have been used successfully.

Other breeds. Other breeds which are fairly common in this country, but which are

less useful to the farmer, are the Chow, the Dalmatian or spotted coach dog, the poodle, the Schipperke, the French bulldog, the Samoyede and Eskimo dogs, the Boston terrier, and the dachshund. The last-named, by the way, is the German badger dog, and might be tried on gophers. There are also the toy breeds, owned mostly as pets—the Japanese spaniel, the King Charles spaniel, the Maltese dog, the toy Manchester or black-and-tan terrier, the toy poodle, the Pekingese, the Pomeranian, the pug, etc.

Mongrels. Many men own dogs of cross breeding or no breeding at all which show great intelligence and ability; lack of pedigree does not necessarily mean lack of character or usefulness. Nevertheless, as in all live stock, purebreds make the best investment. It is a fact that most dogs that are a nuisance to farmers are stray curs of no breeding. A dead dog is better than a neglected, ownerless one, especially a mongrel.

Many dogs, born with the hunting instinct, kill chickens, but they can be trained not to do this, and there should be no trouble with the farm dog on that score. The chief count against the dog is as a sheep killer, and the responsibility for this crime must be laid at the door of the stray mongrel who is not worth his keep to any one. (See Farmers' Bulletin 652 of the United States Department of Agriculture on "The Sheep-Killing Dog," which urges uniform state laws to protect sheep raisers, and the use of better fences.) The best preventive of sheep killing is the well-trained sheep-protecting dog.

How to Train the Dog

Obedience is the first virtue in a dog. If you are going to keep one at all, plan to devote a little time and patience to its early training; it means added comfort and usefulness and a saving of time and vexation in the end. In general, dogs have to be taught by the object-lesson method. Also some dogs are naturally more docile than others, and some of the hardest to teach generally make the most valuable animals.

General hints. The first lesson—in house-breaking—should begin as soon

as the puppy can get about. Keep him in the house a good deal, and take him out often, especially after eating. If he misbehaves, as he surely will at first, drag him to the spot, scold him, and hurry him out, perhaps tying him up for a little while. After a time he will connect his action with yours and "reform." Sometimes it is a good plan to tie the puppy by a short cord close to the scene of his offense. If all other methods fail, use the whip lightly, immediately after the offense, and do not let any case go unnoticed.

Lessons in obedience can hardly begin too soon. At three months a puppy can be made to recognize his master's voice and whistle. Teach him to be friends with the cat before he has met her as an enemy, and get him used to the stock and poultry. Tricks are amusing but of little value; the understanding of orders is the important thing. Use neither too much sugar nor too much whip, though occasional reward or punishment is necessary. By pulling on a long cord tied to the puppy's collar teach him the meaning of "Come here." With your hand teach him the meaning of "Lie down." *Never give a command you are not prepared to enforce.* In the same manner, teach him to "Go back" or "Go home," "Heel," "Fetch it," "Watch it," etc.

When the puppy is a few months old, teach him to swim, not by throwing him into the water, but by patiently encouraging him to go in. If you can once coax him beyond his depth, he will soon learn.

A young dog which has formed the bad habit of chicken killing can often be cured. A severe punishment immediately after a murder, followed by a walk among the poultry under the watchful eye of the master, will often be enough. Another way is to tie the dog to a rope perhaps 50 feet long, let him run after the fowls, then haul him up short and scold him until he learns his lesson.

Training the cattle dog is a more difficult matter, and there are no definite rules to follow. Simply take him after the cows, scold him when he does the wrong thing, and praise him when he does the right one. The main thing is to keep him from getting wild, barking at the cows' heads, etc.

Hunting dogs. The bird dog requires a very special training, and every trainer has his own methods. Success rests largely upon fixing these qualities in the dog: Confidence, obedience, self-control, serious purpose. To do this the trainer must be firm, consistent, and resourceful and must know exactly what he wants to accomplish. A choke collar and long rope are perhaps the most effective appliance for this work.

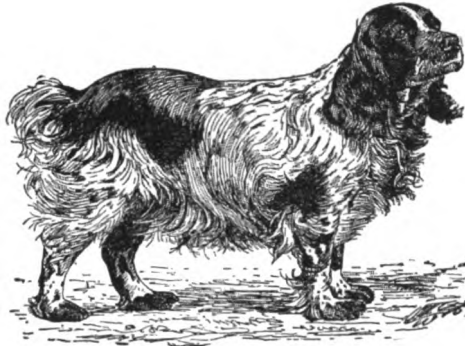


FIG. 173. The spaniels are good retrievers, especially for hunting water fowl. Like other long-haired breeds, they are better kept outdoors than as house dogs.

Raising Dogs for Profit

The equipment need not be expensive, but it should be right; best results cannot be obtained in a corner of the barn or woodshed, but call for a tight, dry house, with separate rooms for the dogs of different ages and a separate, stoutly fenced, well-shaded run for each room. The rooms should be about 8 feet square, and high enough for a man

to stand erect in, each with a bed. It is well to provide a separate building for a hospital, or for the brood matron when in whelp. Neither house should be heated, but both should be clean, dry, and free from draughts. Dampness produces disease; dirty kennels mean fleas, skin diseases, etc. Permanganate of potash makes a good deodorant and purifier.



FIG. 174. The coach dog or Dalmatian is not commonly found on farms, but its intelligence and faithfulness have often been proven elsewhere.

If a large house is not possible, individual houses may be made out of piano boxes, with a yard for each enclosed in chicken wire.

In choosing the breed to raise, study the demands of the local market. Near cities the toy breeds are much in demand and find ready sale. Great Danes and other large dogs are popular, but require more room and food and are a greater care to the beginner. In many places bird dogs are the best for the farmer to raise, while there is always a sale for the larger-sized Airedale terriers, weighing from 50 to 70 pounds.

Breeding stock with long show records and gilt-edged pedigrees is not necessary; it costs too much money for the average beginner. But get pure bred stock of the right type and absolutely sound; there is no money or satisfaction in second rate stuff. Buy if possible from a reputable kennel and look into the records of parents and grandparents for possible constitutional diseases, bad temper, etc. Avoid inbred stock. Good, young

dogs without fancy titles cost around \$50 each.

Beginners are sometimes advised to buy a female that has been bred to a good sire and make their start with the forthcoming puppies, but it is better to have the breeding done under your own eye. It is a good plan to start with a two-year-old bitch that is already a proved mother. Then get a good young mate for her, later increasing the size of the kennel as experience and the demand for puppies increase.

It is wise to register the parents and puppies with the American Kennel Club (1 Liberty Street, New York City). The fee is \$1 each and a registered puppy is always easier to sell.

Puppies are generally most salable when from 4 to 8 months old. They should be thoroughly house-broken to find the easiest market. Bird dogs bring better prices if their training has been begun. In finding a market for puppies, the beginner must remember that he is in competition with well established and widely advertised kennels. His best method is to make his prices slightly lower than those of the big kennels, and advertise them as a feature. If they are too low, however, purchasers will be suspicious; besides, a good puppy cannot be raised from valuable parents for much less than \$15 or \$20. There are always buyers who prefer a farm-bred to a kennel-bred puppy, and this point should be brought out. It is better to advertise such dogs in local, farm and general papers than in papers devoted to kennel interests and that are read chiefly by fanciers.

The farmer should be able to make a good start on a small scale with a capital of \$200. If the bitch raise 5 salable puppies the first year, they should bring in about \$150, and the expense of rearing them under farm conditions should not be great. The second year's profits might be put back into the business and another bitch bought, for 2 litters a year can be sold as readily as one.



FIG. 175. The small breeds, especially the terriers are splendid ratters and good companions as well. a Wire-haired fox terrier; b Boston terrier; c Welsh terrier; d Smooth fox terrier; e Irish terrier.



FIG. 176. Breeds of rabbits differ mainly as to size and markings: From left to right: The English, large and white with color only on tail, ears, eyes, and nose; the lop-eared, hard to raise and less popular than formerly; the Belgian hare, large, active, valuable for its meat and pelt; the Dutch marked, medium-sized, smooth-coated type.

CHAPTER 16

Raising Wild Animals on the Farm

ALL farm animals and fowl were originally wild. The present development of the horse, cow, pig, chicken, etc., in form, character, and usefulness is the result of hundreds of years of care and handling by man; they have been *domesticated*. This change had to come about, for in the wild state these animals were not good enough, and there were not enough of them, to supply the needs and satisfy the tastes of the increasing populations.

Exactly the same condition is now arising with respect to many of the animals and birds that we still call wild. There is a constant, insistent demand for them or their products, but they are becoming too few, and in some instances improvement or "cultivation" would increase their value for man's purposes. Thus the modern farmer and his family are offered an interesting and profitable side line in the protecting, rearing, and disposing of these wild creatures. Besides being a possible source of monetary returns, the keeping of animals can give pleasure, especially to children; it provides useful occupation, arouses interest in, and sympathy for the lower forms of life, and affords opportunity for the practical study of natural history. More important still is the gain that may come from the real domestication of one or more new species.

This work may take the form of an extensive live stock industry in which the animals are bred, raised, slaughtered and marketed as rapidly as possible; or it may mean simply the care of a few individuals as pets or as sources of high class breeding stock to be sold to other fanciers. The two types of work naturally overlap to some extent. In either case there is much to be gained, and the first cost is relatively low. The most essential factors are a knowledge of the animal and its habits, a sympathetic interest in it, and plenty of care of the right kind *at the right time*.—EDITOR.

RAISING WILD ANIMALS FOR PROFIT

By D. E. LANTZ, who was with the Biological Survey of the U. S. Department of Agriculture from 1904 to 1918, studying the problems and possibilities of American wild life in its natural surroundings and more especially in its relation to the farmer and his life and daily work.—EDITOR.

THE scarcity of game and fur animals has led to many experiments in producing them in captivity which have shown not only that such production is possible, but that under judicious management it may be made profitable. The business provides a side line that can well be carried on profitably on lands not suited for ordinary crops. Some animals require but small space

and may be raised on ordinary city or village lots; others require larger areas, brushy or waste land being especially adapted to them. Under the term "wild animals" are included also some partly domesticated species that are not ordinarily kept on American farms; most of them have already been sources of profit to breeders and the rest are promising subjects for experiment. The demand for their products or for the animals alive will always be greater than the supply.

Deer Parks

In the Old World venison is common and comparatively cheap; in America it is available only to the wealthy (as sportsmen or guests at a few hotels) and those who live in parts of the country still inhabited by deer. The European supply comes chiefly from private parks, and if this food is ever to become common in America it must come from the same source. Herds have long been kept by a few wealthy men here, but only recently has attention been given to keeping them for profitable venison production. The chief obstacle is found in the unfavorable laws relating to its sale. Nearly all States that have wild deer forbid the sale of their flesh in the markets and until recently few made any distinction between wild venison and that produced under private ownership. The production of this food is as legitimate a business as that of raising beef, mutton, or pork; yet in parts of the United States, the breeder, during the closed season for wild deer, cannot legally kill his animals for his own use. Some States now permit the sale of venison from parks under a license which provides tags for the identification of the meat. If the license fees are nominal—only enough to cover actual costs—the system works little or no hardship; but high fees, restrictions as to time of killing, and other conditions as imposed in some States naturally discourage breeders. A few States now permit unrestricted sale of venison or live deer from private parks, and it is probable that, reflecting a more favorable public sentiment, all will soon remove the obstacles to profitable deer breeding.

Virginia deer. The common white-tailed deer being naturally widely distributed and suited to all climates, is the best park deer for North America. It is hardy, as easily kept as the sheep, and matures early. The animals are polygamous (1 male mates with several females); the rutting (breeding) season is October or November, and the doe produces fawns in May or June. Young does breed when about 17 months old, usually producing but one fawn the first time, but afterward twins. Fawns are spotted until they shed their first coat in the fall.

Virginia deer feed mainly on leaves of trees or bushes, but also eat nearly all kinds of vegetables, including garden truck, weeds, acorns, chestnuts, moss, and some grass. They should have access to running water and a constant supply of salt. If vegetation becomes scant, feed a small ration of grain; corn is most satisfactory and economical for the animals pick up every kernel. A patch of rape, turnips, or clover supplies excellent food for the late summer; in winter coarse hay full of weeds, oat straw, and alfalfa are better than tame hays. A plot of winter rye or wheat should be a part of every deer park. In the North provide winter shelter.

The fence for a deer park, high enough to

keep out dogs as well as keep in the deer, may be of any convenient material, but smooth woven wire, 6 or 7 feet high,



FIG. 177. The Virginia, or white-tailed deer is the best for North American parks

well nailed to posts set close together, will prove most satisfactory. We have seen herds confined by a fence less than 4 feet high, but until the animals are fully accustomed to the park and unless there are no stray dogs in the neighborhood, something more substantial is needed. The number of deer that may be kept on a given acreage depends on the nature and quantity of vegetation. Horses or cattle can often be pastured on the same land without affecting the deer's food supply.

Buck fawns not needed for breeding purposes should be castrated when a few days old to improve the quality of their flesh and make the herd more docile and easily managed. One vigorous buck must be kept with about every 6 does. To prevent continued inbreeding, bucks of new blood should be obtained every few years.

The cost, pound for pound, of producing venison is less than that of raising mutton, yet the product sells for two or three times as much, if the market is open. The quality of venison from private preserves is much higher than that from wild deer killed in the open hunting season. Some deer breeders take the fawns from the doe when they are very young, raise them on cow's milk, and sell them as tame pets for from \$20 to \$25 each. A buck about 18 months old sold for venison will dress from 80 to 120 pounds.

Elk. The Wapiti, or American elk, is another excellent, hardy park deer, and source of venison. It is managed like the Virginia deer, its food habits being similar, although it eats more of the tame grasses and hay. The does usually have one fawn about 8 and a half months after mating. A stronger but no higher fence is needed than for common deer; no provision is needed to keep out dogs, for an elk herd is able to defend itself from their attacks.

Elk venison is much like that from the common deer and sells at about the same price; but more markets are open and the carcasses weigh much more. A fat elk buck at 18 months will dress 200 to 300 pounds and

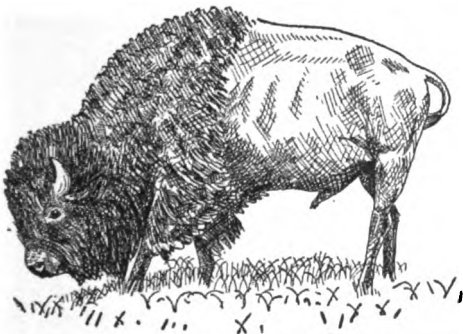


FIG. 178. The American bison is now too scarce to be important, but it is being raised on a few farms and public preserves.

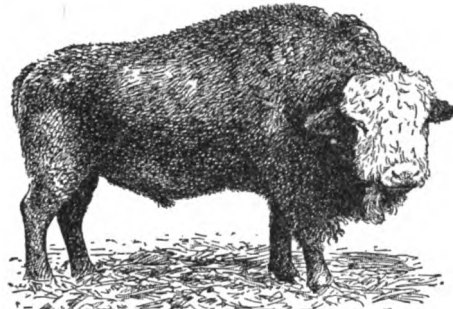


FIG. 179. A "catalo" carrying five-eighths buffalo and three-eighths Hereford blood. Though interesting from a breeder's standpoint, this hybrid has not yet become of commercial importance.

when mature, at 4 years, twice or three times as much. Elk for stocking preserves are in constant demand and surplus stock is more profitably sold for this purpose than for food.

Other deer. Several other species of deer are adapted to park purposes, and under present laws foreign sorts are sometimes marketable where native deer are excluded. The fallow deer of Europe may always be distinguished from our forest deer when shipped in the hide, and may be exported from various States. The small Japanese sika deer is extremely hardy, increases rapidly in preserves, and in spite of its size would probably prove a profitable park deer.

The American bison. The bison, or buffalo, is now kept on a number of private and public preserves; several Western breeders have found them profitable and have been unable to supply the demand for stock. The bison needs a wide range stocked with permanent grasses, must have water and salt, and should have shade in summer. A good 4- or 5-foot fence, preferably of heavy woven wire, will confine the animals. Except when snow covers the ground, they require little food, other than the dried grasses of the range. Herds increase rather slowly, but each animal has a selling value much higher than that of ordinary cattle, buffalo calves selling readily the first year for \$150 to \$200 each. The flesh reaches a market so rarely that its value cannot be estimated.

The "catalo" is a hybrid produced by mating a bull bison with a domestic cow, usually of one of the beef breeds. The male offspring is sterile but the female is usually fertile as are males of the second generation with three-quarters buffalo blood. The hybrids are large animals and very hardy but in few characteristics superior to common cattle. The bison-Galloway cross produces a very fine robe, but the general advantages of breeding these hybrids have not been proved.

Rabbits and Hares

These well known animals are kept in special fields or enclosures called "warrens" when wanted for hunting, and more commonly in smaller numbers, in smaller enclosures, where hutches are provided for them. All the breeds of domestic rabbits belong to the Old World wild species, whether called Siberian, Angora, Abyssinian, Himalayan or whatnot, and simply show what can be done by breeding and selecting. They can all be raised on the farm, and even the wild types—the cottontail and jack rabbits, the Northern and Arctic hares etc.,—make good pets. But for the average breeder, the large, quick growing sorts such as the Belgian hare and Flemish giant, are most profitable. While they may be kept in the open, they do better in hutches and are in the best condition for marketing when 4 or 5 months old.

Hutches should be tight, solid, ventilated, with about 12 square feet of floor space and a height of 2 feet. They may be separate but are usually built or set in stacks of 2 or 3. A good size is 6 x 2 x 2 feet with a movable partition cutting off one-third for a nest and sleeping room. The hutch should be kept clean and dry, and soft hay or straw provided for the nest.

Feeding. Hay of good quality, green stuff and whole or crushed grain—preferably oats—are required, but this permits considerable variety according to what vegetables or green crops are available and cheap. Provide fresh water daily except when green food is plenty, and keep a lump of rock salt in the hutch or pen. Feed twice a day giving suckling does an extra quantity or a third meal at noon. But don't overfeed.

Breeding. Mate old stock in February and young does in March, but never before they are 6 months old. Young are born in about 30 days, but does should not be allowed to have more than 4 or 5 litters a year. Give plenty of nesting material and feed the doe milk and soft mushes just before and a week after the litter arrives. The young are weaned when 4 to 6 weeks old and for a time may then be kept a dozen or so in a hutch, but each breeding doe should have a hut to herself, and as the bucks grow they usually have to be kept apart.

Marketing. In some sections but few rabbits are offered for sale as food and a breeder may have to build up a demand, which with good stock should not be difficult. In many Western cities Belgian hares weighing 5 to 7 pounds dressed, sell readily at 20 cents a pound, returning a better profit than poultry. Skins of solid colors also have a market value if properly prepared (Chapter 48). Rabbits may be marketed alive (shipped in crates), or dressed. Kill by dislocating the neck, or by giving a sharp hard blow on the back of the head with a heavy stick of hard wood, then bleed from the jugular vein, and remove the entrails leaving heart, liver, and kidneys in place. If for market leave the skins on; private trade may prefer skinned carcasses.

Cavies or Guinea Pigs

Cavies are kept as pets and used to a small extent for food, but mostly by scientists in standardizing serums and doing other laboratory investigational work. Many are required for this purpose and breeders have usually found it profitable to supply them, but some laboratories now economize by raising their own, and it would not pay the farmer to produce the animals in large numbers unless first assured of a market. They require much the same care and food as hutch rabbits, but must be kept in a fairly warm building in cold weather. One male and 5 or 6 female cavies are usually kept in a single hutch or pen.

Do not mate them until 6 months old. The female goes 9 or 10 weeks with young, producing 2 to 6 at a litter, and may be bred 4 or 5 times a year. In raising show and breeding stock, much attention must be given to the markings and other characteristics of the many fancy types.

Raising Fur Animals

Raising fur animals in captivity began about 1870, when the high price of mink fur tempted a number of men to experiment with this animal. The results were successful until the fur became unpopular, when the enterprises were abandoned because of low prices. The skunk next became the subject of experiment, but mistakes of management led to failure. The silver black fox was first raised successfully on Prince Edward Island, where a few pioneer breeders amassed fortunes from the sale of the valuable pelts. For several years these men refused to sell live foxes and kept their methods secret. Then others, on the Island and elsewhere, secured wild stock and bred foxes successfully. Finally the early breeders relented and the business of raising foxes was soon exploited by many companies and with heavy investments; fine foxes for breeding purposes sold for more than \$20,000 a pair. The European war checked unwarranted speculation and prices fell to a reasonable advance over the fur value of the animals. At present the business of raising foxes is on a safe basis; fur and breeding stock bring good prices; and both individuals and companies are prospering. About \$30,000,000 is invested in the fox industry on Prince Edward Island and probably as much more in other parts of Canada and the United States. As with game animals, a few states have restrictive laws which hamper the breeder of protected fur animals and sometimes seem unnecessarily burdensome to those who are merely experimenting in fur production. Doubtless they will soon be modified to meet the breeders' needs.

Fur raising should be undertaken only with animals well suited to the local climate, that is, such as produce good fur in the wild state there. For example, the silver black fox, which does not occur in the South, could probably be matured successfully there, but the fur would be inferior and within a few years the animals would probably degenerate, producing only ordinary red foxes. The fur rancher's adaptability to the business is another important factor.

Foxes. The silver black fox, a color phase of the common red, is the most

profitable fox to raise because of the value of its fur. Foxes are generally kept in pairs but it is possible to breed a male to 2 or 3 females. The yard for each pair should contain about 2,500 square feet; well drained land with trees for summer shade is necessary. The fence should be 9 or 10 feet high (more where snow drifts badly) of galvanized wire netting on good wooden or iron posts set about 12 feet apart. It should be bent in at the top making a two foot overhang, and to prevent the animals



FIG. 180. Cavies or guinea pigs: *a* Dutch-marked English or smooth-coated; *b* Abyssinian or rosette-coated; *c* Peruvian or long-haired.

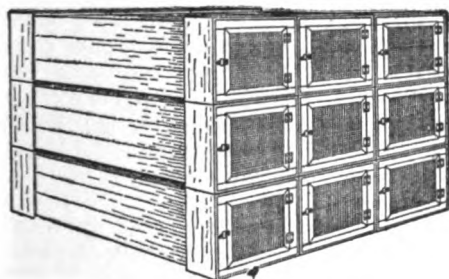


FIG. 181. A stack of hutches for raising cavies commercially (Farmers' Bulletin 525)



FIG. 182. *a* The rare and valuable silver black fox; and *b* the common red fox of which it is an offshoot

chaff, etc. The entrance passage should be covered or made with a right angle bend so as to shut out light and prevent draughts. An outer fence built the same as the yard walls should surround the entire ranch.

Foxes are fed once or twice a day on meat, fish, milk, bread, mashed potatoes, crackers, mush, dog biscuits, and soft fruits. A standard ranch diet is milk, with bread or some kind of cooked mush; if the foxes are fed twice a day, meat is given in the morning and the other food at night. Some keepers feed meat every day, others only 2 or 3 times a week; young foxes should have none until they are about 4 months old. The meat supply may be cheap, such as horse flesh or butcher's waste, but it must be fresh and untainted. Freshly killed rabbits or woodchucks (skinned) are used when obtainable. Cooked meat is preferred on some ranches. Fresh water daily, clean surroundings, and careful feeding are essential.

Female foxes do not always breed when a year old and may fail to do so in other years. They are pregnant about 51 days, whelping in April or May. The average litter is about 4, but because not all females breed regularly, an annual increase of about 100 per cent may be expected. The cost of fencing and dens is from \$100 to \$150 per yard, and a pair of foxes cost from \$300 to \$500 for the common silver, to several thousand dollars for the better animals. The profits of successful ranches are very large; even with ordinary success they are higher than in other lines of husbandry requiring like capital and attention.

Cross foxes (showing markings of silver black on the shoulder and back) and red foxes are managed in the same way as the silver blacks, but with less profit to breeders. Both produce comparatively good fur farther south than the silvers and the initial investment is less. Cross pelts bring \$20 to \$50 each; red ones, \$3 to \$10. Some successful breeders of black foxes began with the cheaper animals, and by

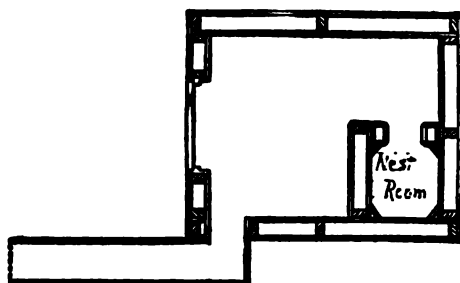


FIG. 184. Plan of double-walled fox den. The entrance should always include a right angle turn to shut off light and draughts. (Farmers' Bulletin 795).

from digging out, the netting should extend 3 feet into the ground or be turned in at the bottom. Netting should be of 14 or 15 gauge wire, the lower sections of 1½ and the rest of 2-inch mesh.

Each yard should have a warm, dry den with double walls or a tight barrel surrounded by a box, the space between being packed with dry saw dust, leaves,

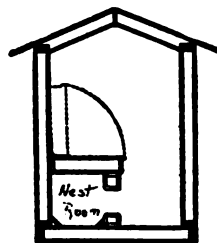


FIG. 183. Section across a double-walled house or den for foxes. The top of the double-walled nest room is hinged to permit cleaning.

introducing a male of the finer kind and practising careful selection have developed good stock. Red foxes are often sold alive for hunting instead of for their pelts. Blue foxes have been raised in both Canada and the United States, but they are not recommended for breeding south of Alaska.

Other Fur Animals

Minks. Minks may be profitably grown for fur when the pelt sells for \$5 or more. Those

who have made money from them have usually depended on the sale of breeding stock, the demand for which would cease if many persons raised them, where breeders of average animals would have to depend on the sale of pelts.

Minks in the wild state eat only animal food, and if caught alive require at first a diet of meat or fish; later they may gradually be taught to eat other food. Those raised in captivity are fed about the same diet as a domestic cat. An inexpensive mush of wheat bread, corn bread, cooked oatmeal, boiled rice, or mashed potatoes, mixed with a little chopped or ground meat and softened with milk or broth, is excellent but should be varied from day to day and fresh meat should be fed frequently. Feed twice daily, not more than is eaten up clean in a few minutes. Keep feed pans clean and provide fresh water daily.

Mink pens should enclose about 32 square feet each. The floor may be of concrete covered with sand, or of heavy woven sand screen under 2 inches of sandy soil. The sides may be of heavy netting (one inch mesh), galvanized sheet-iron, or smooth boards set on end. If netting is used, it must cover the top of the pen; if boards or sheet-iron, the walls should be 6 feet high. A single animal or a pair may be kept in each pen. A nest box should be 1 x 1 x 3 feet, with a cross partition cutting off one-third, and an entrance hole 4 inches in diameter with a slide door to keep the mink in or out as desired. Minks may be kept in pairs or with one male to 4 or 5 females. The rutting season is in February or March, the young being born in April or May. Run males with the females for about a day or if pairs are kept, separate the two at the end of the rutting season.

Martens. Martens require about the same management as minks, but being larger and more active need more space. Pens should



FIG. 186. The mink, a profitable fur animal for the farmer to raise

have 48 square feet of floor space, be 8 feet high, and be built in series with connecting doors to let the keeper pass from one to the other. They should be shaded in summer but arranged so that sunshine may reach some part of each pen every day. The floor should be of galvanized one-half inch mesh sand screen covered with three or four inches of sand or sandy loam, and the walls of 1-inch mesh heavy netting. A good roof is needed and a section of a tree with branches in each pen. Each animal should have its own pen and nest box, but when they agree well several may be allowed to run together, except when females are with young. Feed about the same as minks. Females with young are fed twice daily; others once or twice, as the keeper finds most convenient. Some persons have failed to get these animals to breed in captivity while others have succeeded quite well. Pelts are worth from \$10 to \$30 each.

Fishers. About the same management is required for fishers as for martens, and the value of skins averages about the same. The animals are less quarrelsome and seem to breed more regularly in captivity.

Skunks. Skunks are raised successfully in most parts of the United States and southern Canada, many breeders selling the better animals for breeding purposes and only the lower grades for fur, therefore paying but little attention to the production of good pelts. The animals are often kept in small runs with scant room for the female, her young and the nest box, with the result that the fur is thin and brings lower prices than that taken from wild skunks. Good fur can be obtained by turning the animals into a large run for about 3 months before killing time. An acre of land will accommodate about 100.

To prevent the old skunks from killing and eating the young ones, give each breeding female a separate pen about 4 x 8 feet, with walls of smooth boards set on end, sheet-metal, or 1-inch mesh netting. If of netting an overhang is needed to prevent the animals from climbing out. Set the netting well in the ground, or make other provision against the skunks digging under the fence; and provide a nest box.

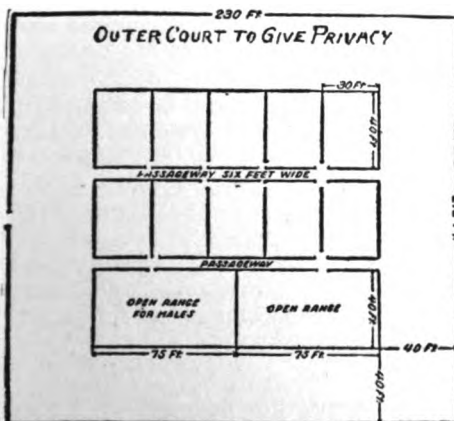


FIG. 185. Plan of a farm laid out for fox raising. The animals must be protected from both enemies and curious visitors.



FIG. 187. Skunks are easily tamed, easily raised and offer a profitable and practical side line

Skunks are easily kept, but profits depend largely on the availability of a cheap food supply. Some breeders depend on waste from slaughter houses, hotel kitchens, or the home; others provide in part by drying the meat of a worthless horse or other farm animal, which keeps well and may be fed either cooked or raw. Skunks eat nearly all kinds of table scraps, bread, and milk, but some meat is necessary, and fresh water must be provided regularly.

Skunks breed once a year in the spring, producing litters of from 4 to 8. It is not necessary to remove the scent sacs but the operation makes it easy to ship animals by express and occasionally to sell them as pets or rat destroyers. The sacs are best removed when the skunk is about 6 weeks old, when they show as very small glands under the skin one at each side of, and close to the anus. Only a slight cut is needed to expose and remove them. If left until the animal is fully grown, they are large and surrounded with tough muscles and their removal is much less simple, sometimes resulting in the death of the skunk. The cost of keeping the skunk until the fur is prime in winter is estimated at from \$1 to \$2 not counting labor, so only the better grades can be profitably raised for the fur.

Opossums. Opossums are easily kept, eat almost anything, and require but little room and inexpensive pens which, how-

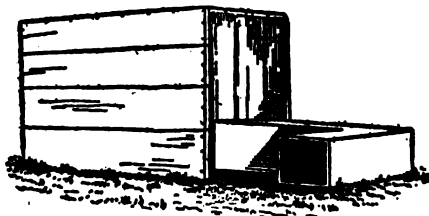


FIG. 188. A cheap, homemade den for foxes, where the weather is not severe

ever, must be covered with netting and arranged so that the animals cannot dig out. The females produce from 7 to 12 young about 3 times a year. The skins are in good demand with prices advancing. The flesh sells readily in most markets, especially with the pelt on.

Raccoons. Raccoons are easily kept on a variety of foods and breed in captivity, the female having 3 or 4 young once a year. Yards should have sides 3 or 4 feet high of boards on end or heavy 2 inch mesh woven wire with a sheet-metal overhang to keep the animals in. Each yard should also contain a tree to furnish shade and a climbing place for the raccoons.

Before the female has her litter place her in a separate pen with a nest box and keep her there until the young are large enough to be safe from the male or other raccoons in the general yard.

Other animals. Beavers and otters have been bred in captivity, but it is difficult to provide suitable surroundings under average farm conditions. Muskrats have been raised in small pens but under such conditions are unprofitable. However, where there are marshes or ponds on the farm, stocked with proper vegetation, where the rats can be protected from poaching, no wild animals will yield better returns with less outlay. They find their own food and the only labor involved is that of securing the pelts. Tide- and fresh-water marshes in some parts of the country yield better returns from muskrats than equal areas of nearby farm lands from crops. Ferrets, also, have yielded good returns in some cases. Although laws in many States prohibit their use for taking rabbits and other game, they are in steady demand at good prices for killing rats. They require about the same kind of food as minks and similar care and housing, but being tamer they need less expensive pens; ordinary packing boxes are often used; they are not kept outdoors, but in a barn or shed.



FIG. 189. Section across rump of skunk to show scent glands. a anus; b its muscle; c where to put clamp when removing her in a separate pen with a nest box and keep her there until the young are large enough to be safe from the male or other raccoons in the general yard.

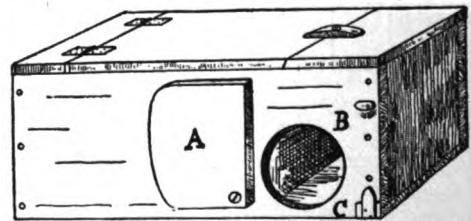


FIG. 190. Box for raising skunks. b, is the entrance way leading through a second round opening into the body of the box. To close the box swing the door a into the support c.

THE CARE OF PETS

(The following material has been prepared jointly by D. E. LANTZ and the Editor, with the assistance of book entitled "Pets for Pleasure and Profit," by A. HYATT VERRILL, published by Chas. Scribner's Sons, New York, to which any one desiring information on the raising of any kind of pet animal or bird, is referred.)

IN raising any kind of animal for profit the aim is to get the greatest possible increase, of the type that best satisfies the market demands, with the least trouble, and at the least expense consistent with success. The raising of pets may begin that way but finally it becomes the care of one or a few favorite individuals which assume more or less the rôle of companions, and which are not expected to produce young, or return a profit but to get along with a minimum of attention. Probably more animals are kept for pleasure than for profit, but many of them are unfortunately sorry looking objects because of ignorance of their needs or poor judgment in the choice of what to keep.

The choice of a pet depends on several things, such as a supply of suitable food at all times; the habits of the animal and its adaptability to the conditions that surround it; climatic conditions; the existing facilities for housing it properly. For instance, no animal that lives entirely on insect food can ordinarily be kept the year 'round except in the southern states; if you live in a grain belt where green vegetables are not abundant, choose species that are distinctly grain eaters, etc.; some sorts cannot survive the lack of freedom and exercise imposed by small pens or cages; tropical animals rarely stand northern winters, and some suffer even inside heated houses unless the temperature can be kept absolutely uniform. For the farm boy and girl the best pet is an animal that is adapted to the locality and that is either captured when very young, or that has been born in captivity and is consequently a little way along the road to domestication. At the same time some animals that are gentle and playful while young, develop undesirable size, strength, or a savage temper as they grow older, making it finally necessary to either destroy them, or dispose of them to circuses, etc.

The Care of the Cat

Outside of the dog, and occasionally a pony, calf, lamb, or other farm animal (the care of which is treated elsewhere in this volume) the commonest pet is probably the cat, yet "scarcely one in a hundred is properly cared for or fed." It is the neglected or abandoned cat that becomes a community nuisance and that has aroused widespread prejudice against the whole race; and it is the owners or former owners of such cats that are to blame. It is cruel and unfair to the animal as well as your neighbors to keep a cat for a time then, upon moving away or getting tired of it, to turn it loose to shift for itself. Likewise no cat should be allowed to roam by night, or be fed so sparingly that it develops the habit of foraging for birds by day. The house cat requires considerable attention, the main points being to avoid overfeeding, excessive petting and high temperatures indoors. One or two cats can of course be kept indoors much of the time, but they need air and exercise every day if possible, and a daily combing or brushing is just as valuable in the care of a fine cat as in that of a dog or horse.

Cats on the farm can be really useful as mousers or even ratters. Some strains or families seem to have inherited or developed the habit more strongly than others. For this purpose they should be allowed their liberty at night, in or around the barns, granaries, etc. Feed moderately twice a day, but give only a pan of milk in the evening. The half starved, thin, listless cat is not the best hunter, any more than the poorly fed man is the best, most effective soldier. Do not, however, let the rodent-hunting cat get the habit of roaming the woods in search of birds.

If a number of cats are raised give the same general attention to houses, pens, runs, cleanliness and feeding as dogs require. Bread and milk squeezed fairly dry, table scraps, potatoes, gravy or soup, rice, meat scraps, fish heads, etc., are all good. Boiled milk is less likely to cause worm troubles than raw; too much meat and cereals in hot weather are undesirable; and *never* give small, sharp fish or chicken bones. Give fresh water in clean dishes every day and renew the bedding and sawdust on the floors frequently. An occasional sprinkling with oil of eucalyptus is an excellent disinfecting measure.

Wild Animals as Pets



FIG. 191. Inside a fur farming pen. Note the wire turned in at top and bottom of fence to keep the animals from digging or climbing out.

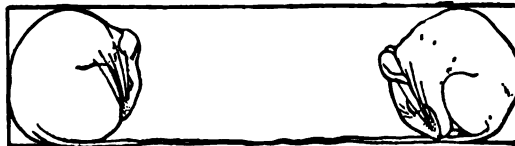
As a rule wild animals and birds are not adapted to captivity, and unless they can be turned to commercial advantage should be left in the wild state. Some of them—the large flesh-eating mammals, such as the bear, wolf, and wildcat—are a source of amusement while young but cannot be trusted when fully grown. The raccoon, fox, mink, skunk, opossum, and some other fur animals, if not irritated by too much attention, remain gentle when grown. Wild rabbits and hares require more attention than the domestic species and are not well adapted to hutch purposes. They may be kept in fenced runs where they have considerable liberty, but unless they are thoroughly tamed while young, they soon go back to their natural wild state. The principles of caring for all these have been discussed earlier in this chapter. As pets they require the same care but more of it.

Our native *squirrels* are among the best of pets for children. They may be kept in cages of any size, but must have plenty of exercise. A good plan is to build a large outdoor cage, 10 or 12 feet square and 10 feet high, of 1-inch poultry or similar netting. Run the walls into the ground about a foot; insert a few small trees firmly in the dirt floor; and fasten a weather-proof nest box for each squirrel high up in the cage. The nest should be of dry leaves, moss, or other fibrous material, nearly enough to fill the box. In the breeding season let only one pair of squirrels occupy the same cage. In fact it is really not advisable for children to keep more than one pair at a time. If young are raised they may be turned out when mature; if the surroundings are suitable they will soon learn to shift for themselves. Squirrels should be given their natural feed—acorns and hard-shelled nuts, seeds, corn, fruits, juicy twigs, in fact anything

they will eat. They need water regularly and some shade in hot weather. Keep the nest boxes and the floor of the cage clean at all times.

The smaller squirrels especially the chipmunks and flying squirrels make fine, interesting pets and may be kept in large cages indoors. The flying squirrels are active only at night; only for this reason are they not the most popular of all their kind.

Rats and mice. White, and other types of domestic rats and mice were quite popular as pets a few years ago, but on the farm there seems little reason to prefer such creatures to many others that are fully as interesting and likely to prove much more profitable. A few wild forms found in some parts of the country such as the White Footed, Wood, or field mouse, the Harvest mouse, and the Wood rat of the South and West are dainty, easily tamed if caught young, and rather more cleanly than commoner sorts. Keep them in surroundings as much like their natural homes as possible.



CHAPTER 17

Water Farming

WATER farming, as far as this cyclopedia is concerned, means the use and cultivation by the farmer of food fish and other water creatures or products for use at home rather than for sale. At the same time he should gradually come to look upon bodies of water just as he looks upon fields—as areas which he can successfully control and cultivate and from which he can obtain a very desirable addition to his income. We have in the past thought of lakes and rivers and even the ocean as inexhaustible mines of revenue; we have fished, netted, and trapped with no thought of the future, no system of conservation; we have drained ponds, dammed and polluted streams, over fished and under supplied lakes and harbors; and recently, when a meat shortage began to emphasize the value of fish as food, we found our water resources seriously depleted and water products following land products along the road to scarcity and high prices. This is the same awakening that has come to farmers in all sections and all ages, whenever they have found rich virgin soils and attempted to get all the crops they possibly could without thought of scientific methods or provisions for the future. So, too, the robbing of the waters is just as unjustifiable and unnecessary as the robbing of the soil, for system and intelligent care can both increase the revenue of the present and insure that a generous reserve supply be left behind for the future. In this day of conservation every farmer must make the most of every opportunity that is offered him; water farming is a very real, a very worth while, and on the whole a very easily capitalized opportunity.

The range of water farming extends all the way from mere fishing (the taking of what fresh or salt water offers with no attempt at "cultivation") to the practice of an intensive scientific industry in which the ground is prepared, "seed" planted, the plantation cared for, and harvesting done in accordance with moderate, constructive ideas. This chapter provides sufficient information to start a man in the right direction; as he becomes an expert, he will of course expect to look into more technical sources of far more detailed information. Let him remember at all times that water farming offers (1) a supply of nutritious, delicious food at low cost and with comparatively little trouble; (2) a field for occasional sport and recreation; and (3) a possible income from leased rights to fish in privately owned ponds and streams.

—EDITOR.



FIG. 192. Different stages in fish growth: eggs, fry, advanced fry (sometimes called "fingerlings"), and full-grown fish

FRESH WATER FARMING

By G. C. EMBODY, Assistant Professor of Fish Culture, New York State College of Agriculture. His knowledge of the subject and its possibilities is reinforced by a knowledge of the farmers' needs and opportunities gained during the years he spent on his father's farm. New York has long been a favorite resort of the fisherman; now, under the lead of Professor Embody and other supporters of conservation it is studying the subject of fish culture with a view to becoming a leader in the farm production of food fish both as a side line and a specialized industry.—EDITOR.

RAISING fish on the farm requires a pond or other enclosed body of water which may either be natural, formed by the damming of a stream, excavated or dug out, or with sides built up in the form of dikes. In the first two cases the water supply is, of course, on hand from the outset; otherwise a spring, a well, several small streams, or rainfall and natural land drainage may be used. Of course the climate, the nature of the soil, the lay of the land and other factors will decide whether or not any particular farm offers the necessary conditions; any farmer thinking seriously of fish farming should get expert information before going to any great expense or trouble. However, there are probably few farms in humid United States where something of the kind may not profitably be tried.

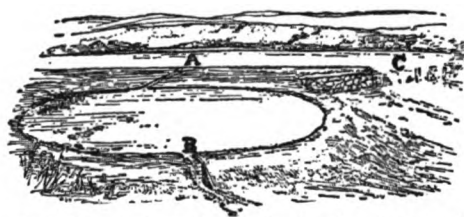


FIG. 193. A farm fishpond showing the relative positions of *a* intake; *b* outlet; and *c* dam in stream. (This and Figs. 196 and 198 to 206 inclusive are reproduced from Cornell Reading Course IV-94).

What fish to raise. There are two classes of fish that can be reared on the farm, those inhabiting cold waters, comprising the various trout; and the warm

water kinds including the black bass, yellow perch, sunfish, rock bass, bullhead, and carp.

The native Eastern brook trout is in highest esteem, has a ready market and commands the highest prices (which range from 50 cents to \$1 a pound). The cost of production may be from 18 to 25 cents a pound which leaves a liberal margin of profit. The European brown trout, introduced many years ago, is almost equal in flavor to the native trout but is not so readily marketed and sells for a lower price. The Western rainbow trout is of good flavor but the domesticated variety seldom appears in Eastern markets. It is possible, however, to propagate the last two in warmer waters than would be safe for the brook trout; hence they make it possible to extend trout raising to farms which otherwise could produce warm water fish only.

None of the warm water fish are propagated in this country on a commercial scale for food, although a few are raised for stocking purposes. The prices quoted for many of them are well above what it is believed it would cost to produce them. The demand for carp is rapidly increasing and with the improved European methods carp culture may become as profitable here as it is in Europe. However, bullheads, perch, pike-perch, and sunfish are more highly esteemed, and at the present time more worthy of the farmer's attention.

Two methods of fish culture may be carried on under farm conditions: the *artificial or intensive* method, and the *natural or pond culture* method. In the first, the spawn (eggs and sperm) is pressed out of the fish by hand, eggs are hatched under artificial conditions, the young are reared to maturity crowded in small basins and the fish are reared upon artificial food. In the second, the fish spawn and hatch their eggs naturally and the young are reared in large ponds where they forage for themselves upon natural food.

Trout are generally propagated by the artificial method outlined imme-

diately below, although it is possible to produce them in limited numbers by the natural method. Warm water fishes, on the other hand, are more easily produced by the natural method (p. 178).

How to Raise Brook Trout by the Artificial Method

Water. Spring, artesian well, or creek water of the highest purity is required. For brook trout the temperature should be constantly under 71° F., and for rainbow and brown trout, it should not exceed 76° F. The quantity will depend upon the number of trout to be raised. A flow of 32 gallons a minute (or what would be conducted through a 2-inch pipe under a head of 6 inches), is sufficient for a plant designed to produce 500 pounds yearly. A trout farm should include (1) a pond for stock breeders, (2) hatching troughs for incubating the eggs, (3) nursery ponds for rearing the very young fishes to yearling size and (4) rearing ponds for producing the table fish. Figure 194 suggests a favorable arrangement of these parts.

Hatching troughs, usually made of boards, are 14 inches wide (inside), 8 to 12 feet long and 6 inches deep. One 8 feet long will

accommodate about 25,000 eggs. Troughs are usually placed in a small hatching house to make the winter care easier, but they may be safely kept out of doors, if provided with suitable covers.

Nursery ponds may be constructed of wooden planks or concrete. A suitable basin to hold about 1,500 young trout until a year old should be 2 or 3 feet wide, 12 feet long and 14 inches deep.

Rearing ponds usually have upright, concrete sides although plankling will do, but the bottom is covered with sand or fine gravel. Ponds of this type vary greatly in size in different hatcheries but one 8 feet wide, 16 feet long and varying in depth from 2 feet at the upper end to 3 feet at the lower will hold 1,500 trout to the 2-year old size.

Stock ponds for

breeders are similar to rearing ponds except that the fish are less crowded. Only 300 breeders would ordinarily be held in a pond 8 by 16 by 3 feet in size.

In all ponds the bottom should slope from inlet to outlet which should be closed with heavy woven wire or a grating made of upright wooden slats. Complete draining is necessary when cleaning the pond and removing the larger fish, hence ponds should be provided at the lowest points with drain pipes leading into a side ditch or sewer.

Operations. Brook and brown trout spawn in November and December, and rainbows from January to April in Eastern states. The breeders are seined (netted) from the stock pond and "stripped" of their spawn as follows:

Rinse a tin pan with water. Take a female (known by her dull coloration and puffed out body) in the left hand grasping her body between vent and tail. Loosen the eggs by pressing the forefinger of the right hand across the front part of the belly. Then move the right hand slowly backward over the belly expelling the eggs into the pan. Then take a male in the same manner and press the white milt out over the eggs. After thus stripping many fish into the same pan mix the spawn elements gently with the fingers and set the pan aside so that impregnation may take place. After 8 minutes carefully add water and allow the eggs to rest quietly for from 20 minutes to 1 hour. Now rinse them carefully to wash out all foreign matter and immediately pour them into a hatching tray, which consists of a rectangular wood frame 20 inches long, 13 inches wide and $\frac{1}{4}$ to 1 inch deep covered on one side with wire screen (window screen will answer the purpose for one season, although heavier screen with a larger mesh is often used). Trays should previously have been painted with a mixture of turpentine and coal tar and wedged tightly into the hatching troughs when they are ready to receive the eggs.

Eggs are very tender until the black eye spots appear. It is imperative that they be disturbed as little as possible and that they be shaded from direct sunlight. Dead eggs become cloudy white and are removed with



FIG. 195. "Stripping" a trout of eggs or spawn (Cornell Countryman XIV-2).

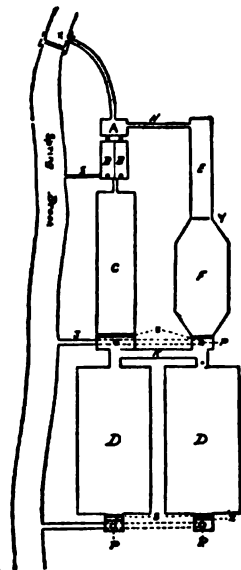


FIG. 194. Plan of a trout-raising plant. *a* distributing basin; *b* hatching troughs; *c* nursery pond; *d* rearing ponds; *e* spawning race or pool; *f* pond for breeders; *g* supply pipe for breeding pond; *h, i, j, p* drainpipes; *k* equalizing basin for rearing ponds; *l* screens; *m* intake; *n* flash boards to keep water in rearing ponds at the right level. (Cornell Countryman XIV-1).

Name.	Average length in inches at age of			Spawning season	Advanced fry available	Fingerlings available
	5 months	1 year	2 years			
Common sucker	3	3 to 4	6 to 7	April-May	June	August
Golden shiner	11	2	21 to 3	May-July	July	September
Catfish	11	3	5 to 6	June-August	July	September
Carp	31 to 5	6 to 8	12 to 15	June-July	July	August
Bullhead	21	3 to 4	5 to 6	May	June	July
Pike	5 to 6	8 to 11	14 to 16	March-April	April	June
Pickering	4 to 5	6 to 7	10 to 12	April	May	June
Yellow perch	2 to 3	3 to 4	6 to 7	April	May-June	September
Rock bass	11	3	3	May-June	July	September
Common blue fish	11	3	3 to 4	June-July	July	September
Striped smelt	2 to 3	3 to 4	5 to 6	June-July	July	September
Calico bass	2 to 3	3 to 4	5 to 6	June	July	September
Small-mouthed black bass	21 to 3	4 to 5	7 to 8	May-June	July	September
Large-mouthed black bass	11	3 to 6	8 to 10	May-June	July	September

FIG. 196. Table showing rate of growth and seasonal habits of fish suited to the farm

egg tweezers. Sediment is dislodged by raising and lowering the tray a few times.

Trout eggs hatch in about 90 days, if the water temperature is 42° F.; a lower temperature will lengthen the period while a higher one will shorten it. Newly hatched trout are called *fry*; for about 45 days after hatching each fry is nourished by food yolk like a very young chick, except that in fish the yolk is contained in a sac that hangs outside the body. When this is gone the fry swim up into the current and begin to strike at floating particles when they are known as *advanced fry*. During the fry stage remove all dead ones and keep living ones free from sediment.

Advanced fry are given the run of the hatching trough until about 1½ inch long when they are placed in the nursery ponds. Here they remain for 1 year when they are transferred to the rearing ponds. When

1½ to 2 years old they are generally of market size.

Feeding trout. For the first month after they lose the yolk sac feed advanced fry every 2 hours at least, in order to produce satisfactory growth. Fresh beef liver or hog's liver is the universal food at this time. First put it through a meat grinder, then through a sieve of about 18 or 20 meshes to the inch. Dilute this pulp with water, mix thoroughly, and throw it to the fish a little at a time with a wooden spoon or paddle. Yolk of hard boiled egg, clotted blood, brains and spleen have also been used successfully in the same manner. As the fish grow, coarser food may be used and the number of feedings reduced first to 3 and then to 2 per day. By the following November 1 feeding is sufficient.

For larger fish spleen, lungs, and other scrap meat to which has been added from 20 to 30



FIG. 197. Tweezers for removing dead eggs from hatching troughs. The feather is used to separate them from live eggs. (Cornell Countryman, XIV-2).

per cent of middlings or cheap flour, may be used. Experiments have shown that for brook trout over 3 inches long, a ration of beef scrap, shrimp, bran and flour produces flesh of excellent flavor more cheaply than do fresh meats.

Sanitation. All basins in which trout are reared must be regularly cleaned of all filth and uneaten food if healthy, highly-flavored trout are to be produced. The importance of this procedure cannot be overestimated.

Raising Fish by the Natural Method

If one desires merely to furnish his table with a weekly mess of fish he will not require a very large pond. Probably an acre of water in Northern states and a somewhat smaller area in Southern states will suffice. A commercial establishment, however, to be financially worth while, will require many acres of water divided into several ponds.

Water may be supplied from a spring, creek, artesian well, or an ordinary well, pumped by a windmill. In some parts of the country ponds are supplied by conserving rain and snow waters, and there are also successful ponds which have been dug out in marsh and swamp lands. For warm water fish the amount of water flowing into the pond need only be sufficient to maintain a constant level therein, but if it is desired to produce trout by the natural method, the flow must be very large in order to maintain a safe, low temperature. Avoid forming a pond by damming a stream if possible. Such a pond cannot be controlled during floods, it rapidly fills up with sediment, and it cannot be properly screened to prevent the escape of the fish.



FIG. 198. Section of fishpond showing depth of water and shape of bottom

The shape of the pond matters little although a long narrow one is more easily managed than a round one. In Northern states where a thick layer of ice forms in winter the greatest depth

(near the outlet) should be at least 6 feet. From here a deep channel gradually becoming shallower should extend to the inlet. There should also be an upward slope from the central channel to the sides.

Breeding grounds. In order that the various kinds of fish may breed in the pond, the particular conditions necessary for each must be supplied. An abundance of aquatic (water) plants will furnish conditions necessary for perch, carp, goldfish, and pickerel. A few pond lilies will supply shelter for sunfish, large-mouth black bass, crappies (known also as strawberry and calico bass), and rock bass. Sunken logs or boards will attract bullheads for nest building. A few gravel patches scattered about the pond will be selected by small-mouth bass and if one of these is in running water at the inlet it will provide a spawning place for suckers.

Forage. The productiveness of a pond is limited by the amount of forage present. The organisms upon which fish feed are well known but how to increase their numbers is not an easy problem. However, an abundance of aquatic plants is considered most favorable for their production. Water cress should be planted liberally about the pond margin. Other desirable plants are the pondweeds, water milfoil, hornwort, white-water crowfoot, and wild celery. Certain food animals may be introduced while others, principally insects, will naturally come to the pond. Fresh water shrimps, water sowbugs, and snails of various kinds should be planted liberally. Golden shiners and common goldfish furnish excellent food for all fish that live on other fish, and in the Mississippi region the gizzard shad is valuable for this purpose.



FIG. 199. A homemade box nest with pebble bottom for bass.

Special Types and Their Care

Small-mouthed black bass. At least 2 ponds are needed for commercial bass culture, one for spawning and one for rearing. The first is roughly circular and includes 2 regions, a fish pit in the centre with a depth of 6 feet and, surrounding this, a spawning shelf where the water is not more than 3 feet deep. Artificial nests consisting of wooden boxes, with the cover and 2 sides removed and with gravel on the bottom to a depth of 6 inches, are set out 25 feet apart in rows 6 to 10 feet apart on the spawning shelf. Provide 1 nest for each male bass and 3 females to every 2 males. The breeders will select these nests and carry on their spawning activities.

The rearing pond should be shallow in order to provide maximum growth and should contain an abundant growth of aquatic plants.

It is usually drained each autumn and kept empty until needed the following spring. The very small insects and other animal organisms that form the food of the young bass and live indirectly on decaying plant materials may

be greatly increased by fertilizing the pond a few weeks before it is to be used, with well rotted stable manure at the rate of about 3 quarts per square yard of area covered. The young bass are taken from the artificial nests with hand nets and placed in the rearing pond in late spring, and by fall should vary in length from 2 to 4 inches, when they are readily salable at a good profit for stocking purposes.

Carp culture. In Europe carp are extensively propagated on a commercial scale, but it is doubtful if any American farmer will want to raise them. If raised, fed and cooked properly their flavor is not unpleasant; and millions of pounds of wild carp are marketed every year in eastern United States without satisfying the demand. However, this demand comes entirely from the foreign tenement sections of large cities. Moreover these fish grow and increase very rapidly and soon overcrowd and destroy the feeding places and spawning grounds of more desirable kinds. West of the Mississippi River they are regarded as a greater pest than the English sparrow is on land

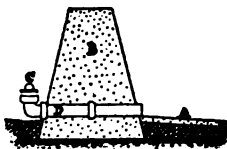


FIG. 200. Section of a dam *b*, with a sewer pipe *d* for draining the pond when the wooden plug *c* is removed. *a* is the concrete apron.

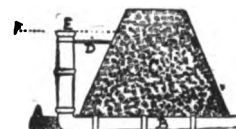


FIG. 201. Section of outlet for fish pond. *a* pond bottom; *b* sewer pipe; *c* dike; *d* support for stand pipe (*e*); *f* water level.

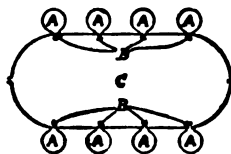


FIG. 202. Plan for increasing the supply of fish food. *a* forage ponds in which manure is placed; *b* screens; *c* main pond.

and attempts to rid lakes and streams of them are useless. Except in enclosed ponds from which they could not possibly spread to larger bodies of water, their culture in warm waters would be a decided risk. If, however, it is desired to raise them, at least 2 ponds, for breeding and rearing, are necessary. From 8 to 10 adult carp per acre of water are placed in the breeding pond where they spawn on natural vegetation or on willow roots tied in bundles and placed there. The rearing pond is generally several acres in extent, the greater part shallow and well covered with aquatic plants. The young carp when 2 or 3 inches long are seined from the breeding ponds and placed in the rearing pond to the number of nearly 200 per acre. Here they remain until 3½ years old, when they should weigh on the average of something over a pound.

Goldfish culture. The operations are much the same as for carp although carried on in smaller ponds. This activity is often undertaken indoors in tubs and small tanks, although in this case artificial foods are used. Bunches of aquatic plants are placed in the spawning basin for the goldfish to cast their eggs on. These plants are then removed to other basins for hatching and the young are finally put in small rearing ponds well supplied with plants, or in some cases previously fertilized with manure. At the age of 6 or 8 months many are large enough for marketing.

There are many beautiful varieties of goldfish. Some, being tender, must be wintered indoors; others are perfectly hardy in Northern waters. The demand for these ornamental fish is constantly increasing and the prices now quoted usually return liberal profits.

Frog culture. There are but four species of frogs desirable for the market, namely, the leopard, pickerel, green, and bullfrog, and of

these the last two are the largest and most desirable. The eggs are laid in masses at different times during the spring and early summer and should be carefully collected and placed in small ponds for hatching. Tadpoles of the leopard and pickerel frogs transform to the adult age within 2½ months after hatching but those of the green and bullfrogs remain as tadpoles for 1 or 2 years. Protect the tadpoles from snakes and turtles by surrounding the pond with a small-mesh screen. Certain birds that prey upon them, such as herons and bitterns may be kept away with a gun or scarecrows. After the tadpoles change into frogs, the young frogs are allowed to forage for themselves in low meadows or protected marshes. About 2 years after the transformation they are ready for marketing.

Tadpoles feed largely upon aquatic plants principally those known as *algae*.

In the adult stage, however, frogs require small living animals such as insects and worms. Ponds with plenty of vegetation generally contain sufficient food for a large number of tadpoles but it is still an unsolved problem how to supply abundant food for adult frogs. Until more is learned on this point frog raising cannot be classed as a lucrative business.

Snail culture. The subject of snail raising is occasionally referred to in daily papers and elsewhere. In Europe this creature is considered a delicacy and is raised, fattened, and marketed in considerable numbers. In this country the taste for it is not highly developed and the knowledge of its cultural requirements is very limited. As a matter of fact edible snails are raised on land, and their culture does not therefore rightly come under the head of water farming. Information on the subject can be obtained, if anywhere, from the U. S. Department of Agriculture, Washington, D. C.



FIG. 203. Another type of outlet for pond. *a* flash boards; *b* apron; *c* core sunk in embankment (*d*); *e* screen.

Diseases of Cultivated Fish

These are serious, as a rule, only when many fish are raised in limited space. But little is known about them as yet, but even the small fish farmer should be familiar with three of the commoner troubles which are as follows:

(1) The water fungus or mold (*Saprolegnia*) attacks fish that have been bruised or weakened by bad food or polluted water. It is rarely serious except in small, crowded trout basins. When it occurs, catch, kill, and bury the more seriously affected fish and give the others a salt bath. Dissolve a cup of table salt in two gallons of water and put the fish in it for 10 to 20 minutes, then return them to the pure water. Good food, pure water, and careful handling generally prevent trouble from this cause.

(2) A very small parasite (*Costia matrix*) attacks trout in crowded basins

in which decaying plant and animal matter have polluted the water. Treatment is the same as for the fungus (1).

(3) There are several kinds of parasitic worms that infest trout, bass, and other fish and which are supposed to be carried by fish-eating birds of the heron family. As the worms rarely kill the fish and usually disappear when herons are absent,

the best preventive is to kill or keep away all birds of this group including the green, great blue, and night herons.



FIG. 204. Section through a dike to show relation between its width (AB) and the depth of the water (AC). AB is 4 times AC.

Harvesting the Fish Crop

The occasional supply of fish for the family can easily be taken with hook and line. A larger catch for sale, or the capture of the largest and most desirable fish calls for the use of either a set line, or better still a seine or trap. The seine is of course useless where the bottom of the pond is very uneven or thickly covered with vegetation. If used, it should have meshes no smaller than $1\frac{1}{2}$ to 2 inches, so that all fish too small to be used can escape without injury. A fish trap with wings made either of wire as in Fig. 205 or of cotton netting supported on wooden hoops as in Fig. 206, is probably the safest plan since it permits the release of small fish uninjured. The opening in the funnel of such traps is large enough to let the mature fish enter but too small to let them out again. The use of such contrivances in public waters is usually illegal; it must therefore be restricted to private streams and lakes. Fish when caught, if handled carefully, can be kept until wanted in a pen or floating "fish car" in one corner of the pond.

Legal aspects. It is unfortunate that many states have laws regulating fish and frog culture. In some states the sale of certain species is prohibited altogether and in others their propagation is possible only after a license is obtained. Any person thinking of going into this line of work should find out from the State Department and Conservation Commission about the conservation laws of the state in which he lives.

How to stock a pond. Fish for stocking the farm pond can usually be obtained free from the U. S. Bureau of Fisheries, Washington, D. C. They can also be bought from various commercial fish hatcheries scattered about the country, and which may be located by applying to state or local conservation or fish and game commissions.

Useful books on fish culture are "Domesticated Trout," by Livingston Stone; "Modern Fish Culture in Fresh and Salt Waters," by Fred Mather; "A Manual of Fresh Culture" issued by the United States Commission of Fish and Fisheries; and "Fish Culture in Ponds and Other Inland Waters," by William E. Meehan.

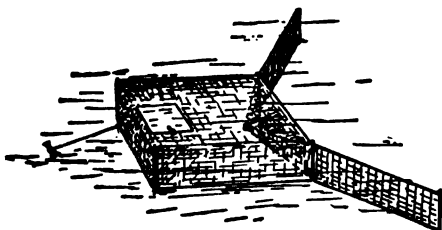


FIG. 205. Wire fish trap with corners supported by stakes and a metal door in the top

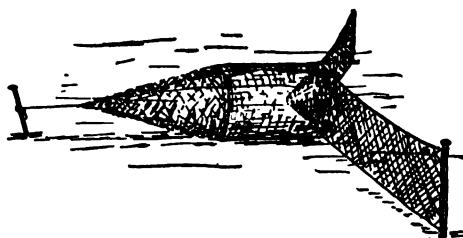


FIG. 206. Fyke net, easy to make out of wooden or metal hoops and cotton netting

SALT WATER FARMING

By DR. DAVID L. BELDING, *Biologist of the Massachusetts Department of Fisheries and Game, who for more than 10 years has been investigating the problems and possibilities of the subject. The sea is to the fisherman what the land is to the farmer—a source of revenue. With the fact that the sea (like the other treasures of our natural resources) is not inexhaustible, before us, we are slowly discovering the remedy—sea farming. For ages man has domesticated food plants and animals on land with wonderful results; there is no reason why he should not apply similar methods to the food products of the sea.*—EDITOR.

THE sea-farm has certain advantages: no plowing, harrowing, or weeding is required; the labor involved is chiefly in harvesting the crop; and most important of all the average yield acre for acre is greater than on dry land. Nevertheless the yield is less certain and experience on the part of the cultivator is absolutely essential to success. The location and character of the property must be carefully studied in regard to the kind of crop to be raised, and the best methods of planting and harvesting must be employed. It is advisable for beginners, wherever possible, to get expert advice before undertaking sea-farming.

Sea-farming for the individual applies only to the cultivation of such marine forms (including shellfish and a few species of real fish), as are confined to the flats and tidal waters of the coast. The propagation of fish that migrate from place to place lies beyond the limits of private enterprise and can best be carried on by State and Federal governments acting together. Therefore it is not discussed here. The marine forms suitable for cultivation by individuals may be grouped as: (1) shellfish, (2) fish, and (3) seaweeds and sponges.

How laws affect sea-farming. Sea-farming directly opposes the principle of the ancient beach law that the right of fishing and fowling should be free to every inhabitant, "as far as the sea ebbs and flows." In most states special provisions have been made permitting the leasing of oyster, and (in a few instances) of quahaug and clam ground. In extending shellfish farming between the tide lines the problem of shore ownership has added to the already complicated general and local laws. In four states, Virginia, Maryland, Massachusetts, and Maine, the title of the shore owner extends to low water mark, but does not include the right of fishing; and the courts have held that shellfish are fish. Therefore the legal protection of an oyster grant, situated below low-water mark, is theoretically better than a similarly leased clam grant between the tide lines.

Shellfish Culture

The term shellfish is popularly and loosely applied to those marine forms which possess a shell and which include (1) *edible mollusks*, chiefly 2-shelled species and snails; (2) *crustacea*, as the lobster and edible crabs; and (3) *marine turtles*, as the Diamond-back Terrapin.

Of the mollusks the species with two shells or valves (and therefore called *bivalves*) such as the oyster, clam, scallop, etc., are most important. They inhabit the shores from high-water mark down to a depth of even 50 feet, thus making possible the cultivation of several species on the same marine farm. A working knowledge of the natural history and habits common to all bivalves is essential to the shellfish farmer.

The soft parts, comprising the gills, digestive tract, circulatory system (corresponding to the blood system), nervous, excretory, and reproductive systems, are enclosed between two limy valves (shells), which are held together by strong muscles. The creature's food consists mainly of microscopic plant forms, called *diatoms*, uniformly distributed through the water in great numbers. An almost continuous flow of water through the shellfish brings to it both this food and the

necessary oxygen. The gills, lined with very small, hairlike tissues called *cilia*, filter the food from the water and carry it to the mouth. Growth is in direct proportion to the amount of food; current means more food; therefore mollusks situated in a good circulation of water will receive the most food and show the fastest growth. With few exceptions (for example, the scallop) the sexes are separate. The eggs (*ova*) and male elements (*spermatozoa*) are discharged in enormous numbers into the water, where fertilization takes place. After the eggs hatch the young larvae (called "fry") maintain a free-swimming existence for a week to 10 days and then "set" to take up their existence on the bottom.

The Oyster

The artificial cultivation of oysters was early practised in Italy. The underlying principles are the same the world over, although in America extensive rather than intensive culture is carried on. The American oyster (*Ostrea virginica*) is native to the Atlantic Ocean and has been transplanted to the Pacific where a smaller variety, *Ostrea lurida*, is found. Several other species are native to Europe and Japan.

Natural beds. In Europe the natural beds have long since been destroyed by overfishing; in the northern field of the Atlantic Coast also the natural beds have disappeared, and in part have been replaced by "oyster farms." Artificial oyster culture consists of (1) spat (young oyster) collecting, and (2) transplanting of oysters from one locality to another; these are usually considered as separate industries.

Spat collecting. In spite of many experiments, artificial rearing of oysters from the egg has never achieved commercial success in America. However, the collection of oyster spat upon a "clutch" of shells or other clean material to which the tiny oysters attach themselves has proved highly successful. Oyster culture requires more preparation and labor than other forms of shellfish farming, depending upon the locality. On certain grants, protection against starfish, drumfish, sting ray and oyster drills must be continually enforced; rubbish, seaweed, etc., must be removed; and the oysters must be culled and replanted. The faster rate of growth possible in warm, Southern waters results in marketable oysters in the Gulf of Mexico in 2 years equal in size to Northern specimens 4- or 5-year-old.

Harvesting. The implements for gathering

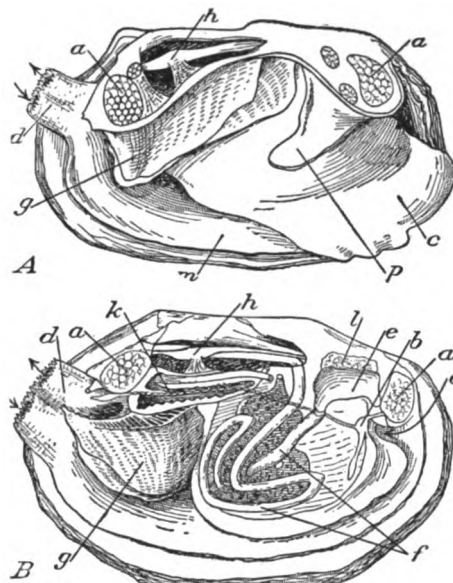


FIG. 207. Interior structure of typical bivalve mollusk (clam). (A) right shell removed; (B) other parts removed to show organs. *a* muscles for closing shell; *b* brain; *c* foot with which clam burrows; *d* part of mantle (*m*) in form of tube or siphon through which water enters and leaves body; *e* stomach; *f* intestine; *g* gill; *h* heart; *k* kidney; *l* liver; *m* mantle; *o* mouth; *p* palp.

oysters are, in shallow water, basketlike tongs worked by hand; and, in deep water, dredges operated from sail or power boats. Oysters are marketed either in the shell or "shucked," as in Chesapeake Bay, where they are shipped to the Northern markets in iced containers.

How to select an oyster grant. Shallow-water, near-shore grants, requiring less money and capital, are adapted to the small planter, while more extensive territory in deep water can be developed only by large companies. A great part of the oyster territory available for the small planter is already taken up. Grants are either purchased outright (as in Connecticut) or leased for a term of years from the various states or towns, subject to local regulations. In the choice of a grant, the prospective planter should be guided by (a) natural conditions favorable for rapid growth, (b) quality, shape, and flavor of the oyster found there, (c) freedom from enemies and pollution, (d) firmness and clearness of bottom, (e) ease of harvesting, and (f) marketing facilities.

The Soft Clam

The soft clam (*Mya arenaria*) has a wide distribution in both the Old and New Worlds. In the United States it ranges from South Carolina north and has been successfully transplanted to the Pacific Coast. Though some-

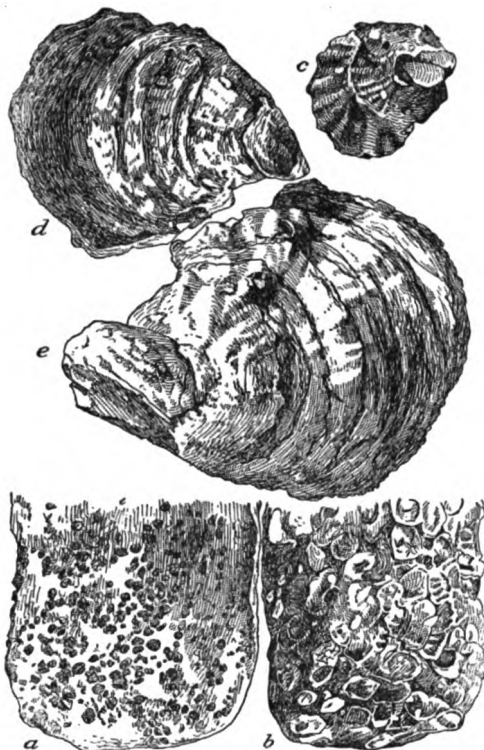


FIG. 208. How oysters grow. *a* spat 2 or 3 weeks old on inside of oyster shell; *b* spat 2 months old on a stone; *c*, *d*, and *e* oysters 1, 3, and 5 years old respectively. All $\frac{1}{2}$ natural size.

times found below low-water mark its normal home is between the tide lines on protected beaches or flats of sand, gravel, or mud. The best soil is a sticky mixture of sand and mud.

Experiments have proved that the only practical way to check the decline in the natural clam supply is for individual fishermen to cultivate tidal flats under a system of leases. The annual yield per acre from such a clam farm is estimated at \$500. A marketable clam (2 $\frac{1}{2}$ inches) may be produced in 1 $\frac{1}{2}$ to 2 years under favorable growing conditions, which vary greatly with the locality and season. The prospective planter should be influenced by the productive capacity of the site as regards favorable soil, water currents, and time of exposure between tides; by facilities for work, comprising convenience to his home, length of time for digging, nearness to market or shipping stations and nearness to an available supply of "seed" clams; and freedom from pollution and natural enemies such as the starfish, horseshoe crab, and cockle.

Planting. Little preparation of the soil is required. Heavy sets of small clams furnish "seed" for planting. These clams, which should be sown broadcast over the surface of the

flat at the rate of 15 to 20 per square foot, burrow rapidly when covered with water. The planting cost depends upon abundance of seed, ease of obtaining it, and transportation. Artificial rearing from eggs has never been accomplished commercially, while spat collecting has proved successful but expensive.

Harvesting. The ordinary method of digging is with a four-pronged, short-handled clam hoe. The outfit of a clammer consists of a dory or skiff, two clam hoes, and four half-bushel baskets, a total investment of \$26. Clams are marketed in the shell as "steamers," or "shucked." During cold weather shipments can be made to distant markets, but in summer clams soon spoil.

The Hard Clam, or Quahaug (pronounced "kwo-hog")

Quahaugs (*Venus mercenaria*) are found from the Gulf of St. Lawrence to the Gulf of Mexico below low-water mark and occasionally between the tide lines and are commercially classed as "littlenecks," "sharps," and "blunts." In the South large natural beds still exist but the Northern supply has suffered from overfishing.

The natural adaptability of the hardy quahaug gives it a wider range than other mollusks, as it will live on almost any bottom and in varying depths of water. Its natural enemies are few and its tight shell permits shipment to distant markets. The cultivation of "littlenecks" would surpass clam and even oyster farming if it were not for the difficulty of obtaining seed for planting. The natural set is scattering, and experiments in artificial hatching and spat collecting have been commercially unsuccessful.

Selecting a quahaug grant. In addition to the conditions affecting growth, the culturist should consider the depth of water and nature of the bottom, as they will influence the labor and cost of raking. The deepwater grant in exposed waters is more expensive to operate than the shallow-water farm. Quahaugs burrow readily and crawl but short distances. By marketing the largest "littlenecks," under favorable circumstances, an acre of quahaugs should yield annually \$750, or a return of \$3 for every \$1 invested.

Growth. In favorable conditions the quahaug will reach a size of 2 $\frac{1}{2}$ inches in 3 $\frac{1}{2}$ years; growth does not take place when the temperature of the water is below 46° F. Quahaugs are taken in shallow water with oyster tongs or short-handled rakes, and in deep water by long-handled rakes or dredges.

Other Mollusks

Scallops. Two species, the shallow-water (*Pecten irradians*) and the giant scallop (*P. tenuicostatus*) are of commercial importance

on the Atlantic Coast of the United States. The former, less than half the size of the latter, ranges from the Gulf of Mexico to Cape Cod; the giant form is taken in deep water, principally along the Maine coast.

Only the "eye" or muscle that closes the shell is used for food. Average shallow-water scallops live less than 2 years, and are taken for market when 15 to 20 months old. They are dredged from the natural beds with sail or power boats, opened and shipped in tubs, principally to the New York and Boston markets. The deep water home of the giant scallop and the free-swimming habit of the shallow-water species render cultivation possible only in enclosed bays with narrow inlets.

The sea clam (*Macra solidissima*) is taken on exposed sand bars with heavy dredges or rakes. It is used chiefly for bait, but occasionally as food. Although valuable, its exposed location and migratory habits, necessitating enclosed grounds, make its culture less certain than that of oysters, or the smaller clams.

The mussel. The sea mussel (*Mytilus edulis*) although until recently but little used in America for food, ranks high among mollusks in nutritive qualities, and may be eaten fresh, canned, or pickled. Its rate of growth compares favorably with that of the clam and its cultivation should prove remunerative.

Snails (*Gastropods*). Fifteen species of bivalves and snails are economically important in California. On the Atlantic Coast the various large snail-like cockles are highly esteemed as bait and in some instances are used as food. The nearest approach to artificial culture is the temporary holding of these snails in enclosures.

Crustaceans

The lobster (*Homarus Americanus*). The decline of the lobster, the most prized salt water crustacean on the Atlantic Coast, has become serious. Legal size limits, protection of egg-bearing lobsters, partially closed seasons and artificial propagation have been tried by State and Federal governments without appreciable success. Uniform regulations in all coastal states and protection of the large adults by means of a double size limit, are advanced as the most effective remedy.

Artificial hatching of the eggs and early freeing of the young has been extensively carried on by the U. S. Bureau of Fisheries. In Rhode Island the young are reared to a more advanced stage before liberation. The rate of growth is slow, a length of 11 inches being

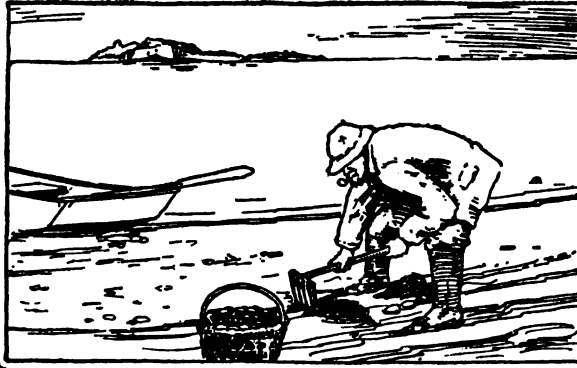


FIG. 209. Seashore farming: a clam digger and his outfit of dory, basket, and hoe

attained in 6 years by the male and 8 years by the female. Cultivation by individuals can be conducted only under certain favorable conditions, such as control of small bays with narrow openings, which can be screened. Good circulation, moderate depth, and absence of fresh water are necessary. In such enclosures undersized lobsters may be reared to marketable size and by the Rhode Island method small lobsters for planting may be hatched.

Crabs. The blue crab (*Callinectes sapidus*), the most important commercial species on the Atlantic Coast, is found south of Massachusetts Bay. It is taken from May to October with dredges, scoop-nets, and small seines in the salt, brackish, and even fresh waters of shallow bays and rivers. It is either immediately turned into crab meat or held in floating cars until it sheds, when, before the new shell hardens, it is shipped to market as a "soft-shelled crab." An active scavenger, it reaches marketable size in 2 to 3 seasons. Owing to its habit of migrating, the possibility of propagating it the year 'round is doubtful. Several other species, including the giant spider crab of the Pacific Coast, are food.

Shrimp and prawns occur along the entire Atlantic and Gulf coasts. The Northern species are too small to be commercially important, but the capture of the larger Southern forms, especially for canning, is an important business. An extensive fishery also exists on the Pacific Coast.

Turtles

Two species of marine turtles, the Diamond-back Terrapin of America and the snapping turtle or soft-shell tortoise of Japan, are artificially propagated. Experiments of the U. S. Bureau of Fisheries with the former indicate that its cultivation is practicable and profitable. Necessary conditions are an enclosure with salt water at high and low tide, and a sloping sand bed for the nests. Good

terrapins for breeding may be obtained from dealers. The young when hatched measure 1½ inch, and at 3 years attain a size of 3½ to 4½ inches. Turtle farming is conducted successfully in Japan where 3- to 5-year-old animals are marketed.

Fish Culture

The propagation of salt water fish is properly the work of State and Federal governments, which have developed definite methods of fish culture. The only fishes available for private cultivation are the species that ascend fresh water rivers to spawn (called *andromadous* species) such as the salmon, striped bass, shad, alewife, sturgeon, and smelt. Of these the alewife and smelt especially offer opportunities to those farmers who are able to purchase or lease fishing rights on the smaller coastal streams.

Seaweeds and Sponges

Seaweeds. The annual income from seaweed industries in Japan, where the utilization of various algae has reached a high state of development, is more than two million dollars. The chief products therefrom are iodine, food, glue, and material used as a basis for jellies. Planting experiments, especially with the *laver*, have already given good results.

In the United States little has been done to develop the seaweed industry. Irish moss, found on the rocks at low-water mark, from Maine to North Carolina, is the most important form, and from May to September is gathered at Scituate, Massachusetts, in large quantities. On the Pacific Coast, vegetable isinglass is made from one type and from others iodine, cellulose, dextrin, and mannite (all used in various industries) are obtained. In view of the present shortage of potash, experiments are being carried on to see if the kelp or coarse seaweeds of the Pacific, which contain considerable amounts of this material, cannot be profitably harvested and treated so as to add to the available supply for agricultural and manufacturing purposes. The artificial cultivation of seaweeds some day may develop into a valuable industry.

Sponges. Sponges are taken from their natural beds in the Mediterranean Sea and off the Bahama Islands, Cuba, and Florida by divers or by grappling. Under suitable conditions the cultivation of marine sponges can be advantageously carried on by planting "cuttings." The cost of planting one acre of an experimental farm with 5,000 cuttings amounted to \$133, and the yield at the end of 4 years was \$968.

Among the best sources of more detailed information on these subjects are "The Oyster," by W. K. Brooks; "Shellfish Industries," by J. L. Kellogg; and various pamphlets, bulletins, and reports issued by the U. S. Bureau of Fisheries, Washington, D. C., and the agricultural and fisheries departments of the various coast states.



SECTION SIX

POULTRY AND BIRDS



CHAPTER 18

The Care of the Farm Flock

By T. F. MCGREW, one of the best and most widely known authorities in the American poultry world. He is equally at home, well informed, and experienced in the class room, the show ring, and the poultry yard of either the general farm or the specialized commercial poultry plant. The fowls kept on American farms total close to 300 millions; the eggs they produce reach nearly 1½ billions of dozens. Every farmer that keeps a few hens helps to make this total larger; it is to his interest and that of the country as a whole to give his flock the best care he can with the least trouble and expense. MR. MCGREW tells how to do this.—EDITOR.

Selecting the fowls. There is no reason why fowls raised on the general farm should not be fully equal to those produced anywhere; yet this is rarely the case, mainly because of too little consideration in selecting the fowls, carelessness in breeding them, and lack of proper care. If the greatest possible profit is to be made from a flock of fowls, whether on the farm or elsewhere, the entire flock should be of one variety.

In selecting fowls the first step is to decide whether an egg breed, a meat breed, or a general purpose type will best suit all conditions. General purpose fowls are usually best for the farm, because they answer for both egg production and market purposes. In such a case any one of the different varieties of Plymouth Rocks, Wyandottes, Rhode Island Reds, or Orpingtons will be satisfactory; if fowls of the largest size are required, select the Brahma.

If brown-shelled eggs are preferred, one of the American breeds of fowls will meet the requirements, the Plymouth Rocks, Wyandottes, Rhode Island Reds perhaps the most profitable producers of this class. If white-shelled eggs are desired, select Leghorns, Minorcas, Campines, or Anconas (Minorcas if eggs of the largest size are wanted). For table poultry with white skin, the Orpington or the Sussex will answer best; for a yellow skin and carcass, the Plymouth Rock, Wyandotte, or Rhode Island Red should be chosen (for descriptions of these and other breeds and varieties see Chapter 20).

A farm flock may be started with a few hens of any pure variety, they and the males also being true to the variety, and good as individuals. *Size, shape, color,* and *vigor* are the four qualities to select for, vigor being the most important. Another way to start is to purchase eggs for hatching from some one who has good fowls of the kind wanted; but all things considered, the best method for the general farmer is to buy the fowls.

General care. To be profitable, as it can be, the farm flock must have as good care as other live stock. It is useless to even hope for reasonably fair re-

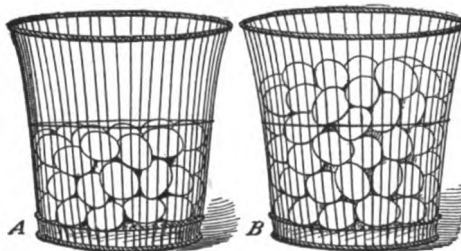


FIG. 210. The average hen in the United States lays 60 to 70 eggs a year. A fairly good hen will lay 120. They cost about the same to keep. What is the answer?

turns unless the fowls are kept free from vermin and their houses clean and sanitary. Fowls infested with lice or mites can neither be healthy nor lay many eggs; nor will they thrive if compelled to lay and roost in filthy houses. While it is always wise to whitewash the interior of poultry houses, it should be understood that lime wash will not destroy hen lice, red mites, or their eggs. Careful and frequent disinfecting and constant care are essential.

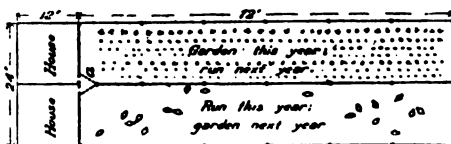


FIG. 211. A double poultry yard half of which can always be kept in some soil cleaning crop. The gate (a) admits birds from one or both houses to either or both yards as desired.

many hens as one male will care for; if 2 males are kept with a lot of hens in close quarters, one will be master and the other practically useless, with necessarily poor results. If more than one male is required, let each one run with the hens for a day or two at a time, the others being shut up in coops between times.

Fertile eggs, that is, eggs laid by hens that have been served by a rooster, spoil quickly if the temperature is higher than 70 degrees F., whether in the nest, the store or on the way to market. Probably the greatest single loss in the egg industry is caused by the development of blood rings, "spots" and "rots" under such conditions. Since sterile (unfertilized) eggs are not thus affected by weather conditions, it is best to keep hens and roosters separate except when eggs for hatching are wanted. Either keep the males by themselves, caponize them, or send them to market between May 15 and June 1 (saving, of course, any especially valuable birds for breeders). The hens will lay just as well, and the new crop of cockerels will be grown before eggs are needed for hatching the next spring. (For caponizing directions see Appendix, p. 553.)

The poultry house. The chief essential is that its walls and floor shall be dry in all weathers. Allow 4 to 5 square feet of floor space for each fowl, and if possible have the floor of cement. Such a floor must be quite smooth (if rough or uneven it will injure the feet of the fowls that scratch on it), and covered with at least 6 inches of litter of some kind. Soft straw is best but shredded corn fodder will do. The open-front house is best; that is, the front (which should ordinarily face south) should be part glass windows, and part open windows with poultry wire outside and muslin sash inside, the latter hinged so it can be let down when it snows, blows hard, or is very cold (below 20 degrees). This arrangement gives plenty of ventilation, which is very necessary, without causing draughts or dampness. For types of houses see Vol. III.

The yard. Where poultry can be allowed to run loose without getting lost or damaging gardens, the exercise is good for them. Generally, it is better to fence off the parts of the

In general, only enough males should be kept to fertilize the eggs needed for hatching. One strong, vigorous rooster to each 12 or 15 hens in a farm flock of about 100 that has free range, will do. If the birds are confined in breeding pens or small runs one rooster to 7 or 9 hens of any American breed, or 10 or 12 Leghorns is better. Under such conditions, however, it is best to keep together only as

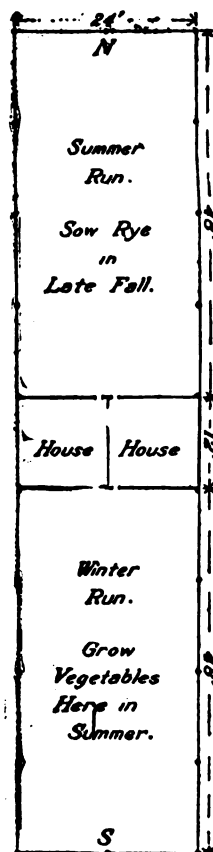
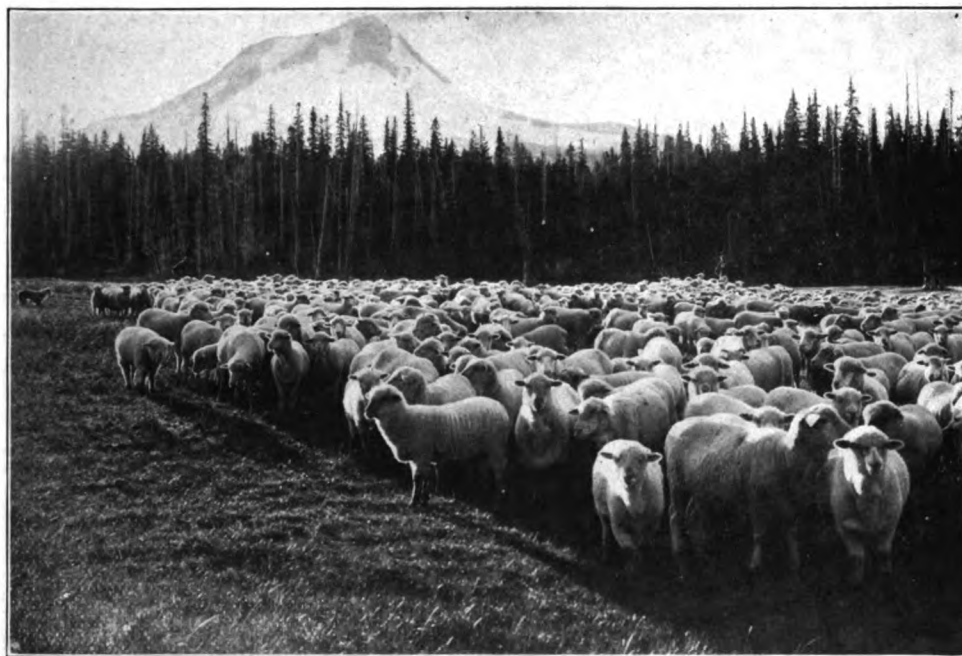


FIG. 212. Another double yard arrangement in which the cool north yard is used in summer and the warmer south yard in winter.

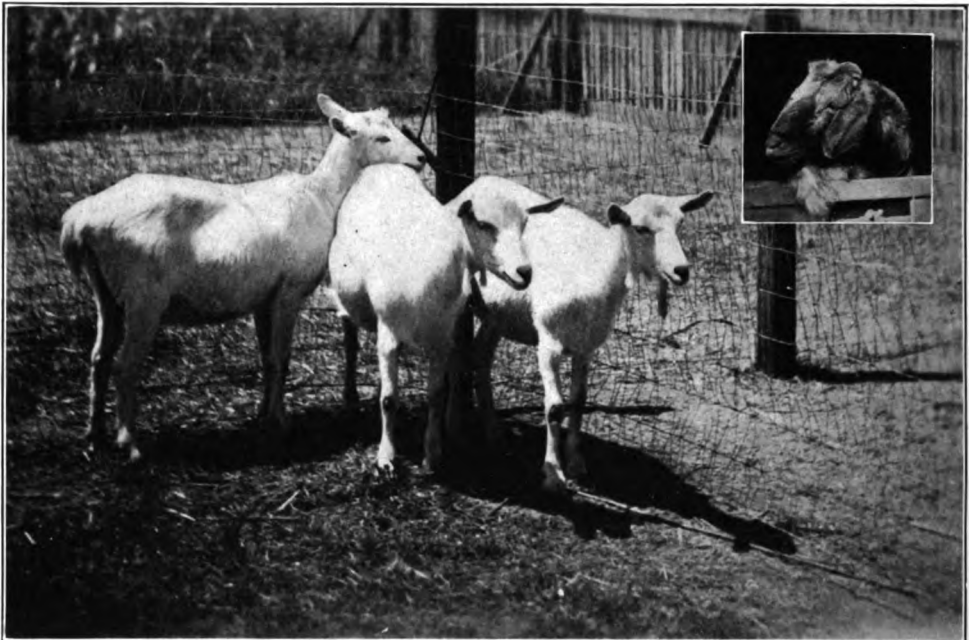


Range sheep represent a picturesque and no less vital feature of our livestock industry



The small, well-chosen flock is one of the safest and sanest features of general farming everywhere

SHEEP PLAY TWO PARTS IN AMERICAN AGRICULTURE



The milch goat is winning—deservedly—the name of “the little sister to the dairy cow.”
These are Saanens; in the insert is the head of a Nubian buck



Angora goats yield mohair and mutton, and clear up waste land while doing it. The insert shows the head of a typical buck

MILCH AND ANGORA GOATS ARE STEADILY INCREASING IN IMPORTANCE

farm they should not run in, than to enclose the fowls in small lots. If they must be kept within bounds, the fence must be 5 to 7 feet high according to the breed, the heaviest, Asiatic types needing the lowest and Leghorns the highest barrier. Allow 100 to 200 square feet of yard per hen, less on sandy, porous soil than on clay. Some of this will be kept bare of grass so it is well to arrange for an occasional change of yard. If the house and land are kept clean and sanitary, up to 500 hens can be kept in one farm flock.

Details of Breeding

Selecting the breeding stock. The first selection of pullets for breeding should be made in the early fall before they commence to lay. The best 50 or 100, according to the size of the flock, should be picked out and kept by themselves until they have grown to the proper size and shape. If possible they should be trapnested (p. 215) during November, December, January, and even February, so that it will be known which of them lay best during cold weather. As the qualities of the parents are transmitted to their offspring, the eggs of only the heaviest layers should be selected for hatching.

The market value of table poultry depends largely on the "finish" of the carcass, that is, its plumpness and attractive appearance, particularly about the breast and back. Some market poultry is so well finished and the flesh so soft and tender that the rye straw in which it is packed makes indentations in the flesh, called "straw lines" which give the carcasses increased value. To produce such poultry, the hens used as breeders must have full round breasts, be broad across the back and wide between the thighs, long in the breast and full in the abdomen, and must be mated with males of the same breed, and their equals in type and vigor.

The best layers are pullets that begin to lay in October, continue until the following September or October, then molt out clean, grow a new coat of feathers, and begin to lay again in November. Some fowls of this kind can be found in every flock, and they should always be used as breeders as long as they will lay. The average run of fowls in a flock will produce neither the best layers nor the best table poultry.



FIG. 213. Handy hook for catching poultry: made of a broomstick and two pieces of No. 10 steel wire. One piece is wrapped around the other half way up to stiffen it. *a* enlarged view of hook end. (New York [Cornell] Bulletin 284).

Choosing males for breeding. The male has a far greater influence on the flock as a whole than the female, for he may be the sire of all the chicks hatched from all the eggs laid by 12 or 15 hens, while each female is the mother of only her own. He should therefore have good ancestry, perfect breed characteristics, and, in addition, be healthy and vigorous. But remember, any degree of perfection resulting from the mating of such birds can be quickly impaired by careless future selection or by the unsystematic crossing of varieties.

Hatching Chicks

The first requirement is hatchable eggs, that is, eggs produced by the matings of such fowls as described above. Next in importance come broody hens, or incubators and brooders of the proper kind. Cleanliness and sanitary conditions are always indispensable, whether the chicks are hatched by natural or artificial means.

Under proper conditions hatchable eggs will produce living chicks with little or no trouble. They will have the vitality needed to withstand the strain of artificial incubation and to assure the rapid, steady growth of the chicks to maturity. Such eggs must be from mature fowls, the best coming from hens in their second or third year of laying; they should be of fairly good size and uniform, weighing about 24 to 26 ounces per dozen.

Hatching with hens. Quiet hens that do not object to being handled when on the nest are naturally the best for hatching purposes. When broody such hens can be moved about with perfect safety, even from the nest in which they are in the habit of laying, to another. This is fortunate for it is best to keep broody hens well away from the others. Before moving a hen prepare her new nest in a box, a barrel, or on the ground in the corner of an out-building where she will not be disturbed. It should be of soft hay or straw, large enough and thick enough to hold the warmth about the eggs, shallow enough on top to enable the hen to turn them, and flat enough to allow the chicks to rest quiet when hatched. It should not be deep enough to let the chicks roll to the bottom and be crowded to death or so shallow that the chicks can fall out.

Before setting the hen thoroughly dust her body and the nest with insect powder or give an application of lice-killing ointment, (p. 349) repeat this on the seventh and fourteenth days of incubation. Work the powder or ointment down close to the skin and about the vent. In moving the sitting hen place the left hand under her body between the thighs grasping her shanks between the fingers of the right; hold her firmly between the hands, lift her gently, carry her to the new nest, and place her in the same position as she was before. Have only 2 or 3 test eggs in the nest at this time. Hold her still for a few moments, then cover her with a box and leave her undisturbed for a time. If she remains quiet for 24 hours, she may be trusted with a hatching of eggs.

Small hens can cover from 9 to 11 eggs, larger ones from 13 to 15; it is best to give a hen only the number that she can cover and keep warm. Plan to feed her once a day, and give her fresh water often. Watch to see that she leaves the nest and returns once daily.

It takes from 20 to 21 days for chicken eggs to hatch (bantam eggs sometimes hatch in 19); if perfectly fresh they may hatch in 20 days; if stale, they may run over a few hours. White eggs usually hatch quicker than brown, wherefore all the eggs under a hen or in the same tray of an incubator should be of the same color.

Hatching with incubators. To give good results, an incubator should be so well constructed that it will hold the proper heat in a room temperature of 50 degrees. Always follow the directions supplied by the manufacturer who knows the exact conditions under which it will furnish just the right heat, moisture, and ventilation; any variation from these directions may disorganize the working of the machine and cause failure. If the incubator is of good construction and the directions are

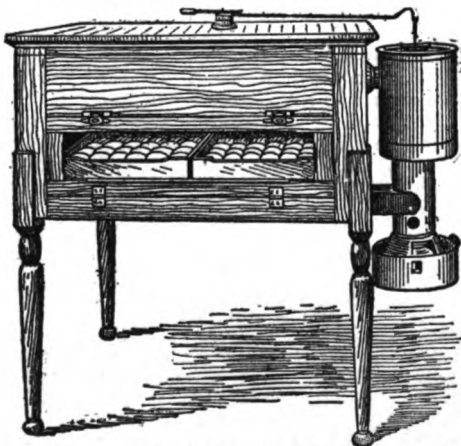


FIG. 214. A small, satisfactory type of incubator for farm use

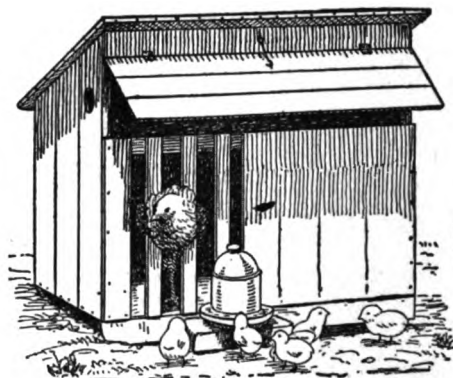


FIG. 215. A good, homemade coop for natural brooding. The hinged flap is for ventilation. Keep the coop on clean, well drained ground.

followed, the one factor responsible for a good or a bad hatch is the vitality of the eggs.

Artificial brooding. When hatched the chicks should be left in the incubator until 24 hours old, then moved to a brooder or hover that has been heated in readiness for them. Follow the printed directions in running the brooder; different types vary in construction and the care needed.

In some brooders the hover is placed inside a box or "nursery," as it is called. There are also many kinds and sizes of lamp-heated, metal hovers, with capacities ranging from 50 to 100 chicks, and others heated with stoves for 300, 500, or even 1,000 chicks. The smallest of the metal hovers can be used in the dwelling, a coop, or even a box; larger sizes must be kept in small brooder houses built according to plans furnished with them.

Almost any one can make a shelter for a metal hover, but the heating apparatus cannot be built as cheaply as it can be bought.

"Day-old" chicks. The hatching and selling of baby ("day-old") chicks to supply those who do not care to bother with hatching or incubating, has become quite an industry. But it requires special equipment, the handling of a great many chicks, and constant attention on the part of two or more persons. It cannot be safely taken up as a side line. Baby chicks of nearly all breeds and varieties can now be obtained at a fair price, enabling one to gain experience in poultry keeping with the smallest possible investment.



FIG. 216. A metal hover brooder showing how heater is lifted for lighting and cleaning.

Feeding Farm Poultry

Feeding hen-hatched chicks. For the first few days, chicks hatched by the natural method should be fed a mixture of equal parts by measure of stale bread and rolled oats or oatmeal, a little at a time but often. As they grow older, add fine bits of cracked corn and cracked wheat to the mixture. Maize or hominy grits with cracked wheat and oatmeal is also an excellent grain feed for little chicks. Once every 2 days give them a full meal of equal parts of hard-boiled eggs (mashed fine, shell and all), bread crumbs, cracked wheat, and oatmeal. Too much hard-boiled egg, however, is not good for little chicks.

Feeding incubator chicks. The best feed for the first day is bread crumbs, or stale bread moistened with sweet milk. Any excess of milk should be pressed out with the hands and the moist bread placed on a clean board. Thereafter, until the chicks are 3 weeks old, bread crumbs or bread, milk, and rolled oats mixed into a dry, crumbly mash, with a good grade of commercial chick feed, will answer. After 3 weeks they may be fed on chick feed, cracked corn, broken wheat, and oatmeal. All young chicks should get plenty of green stuff—lawn clippings, green clover, dandelions, lettuce, vegetable tops, or sprouted oats—also grit and clean water. As soon as they are old enough and the ground is dry, give them a dry, clean place to run and scratch.

After chicks are a week old, in addition to feeding them as just directed, keep constantly before them in a feed hopper, a dry-mash mixture. A good one is 5 pounds of wheat bran, 5 pounds of cornmeal, 5 pounds of wheat middlings, 5 pounds of ground oats, 2 pounds of fine meat scraps, and 2 pounds of dry bone-meal.

After they are 2 months old, all chickens may be fed alike. A feed that will make a young pullet grow will make her lay; a grain mixture that will make a chick grow will make a plump broiler. It is merely a question of healthy chicks, a proper mixture, liberal feeding and plenty of exercise. At this stage nothing is more dependable than a grain mixture composed of equal parts, by measure, of whole wheat, cracked corn, and oats. Feed this with a dry-mash of equal parts, by measure, of wheat bran, cornmeal, ground oats, and wheat middlings with 1 part of meat scraps to every 10 of the mixture.

All poultry need plenty of green feed. If they have free range or a good stand of grass and weeds in their runs they will get enough. Otherwise supply garden refuse, cabbage, stock beets or sprouted grains—commonly oats or barley. These are especially useful in winter and may be sprouted in trays (Fig.



FIG. 218. A rack and trays for sprouting grain.

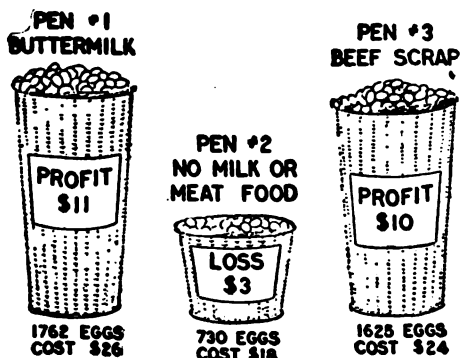


FIG. 217. Showing the results of experiments at the Ontario Agricultural College as to the effect of animal food in the fowl's ration. (Courtesy International Harvester Co.)

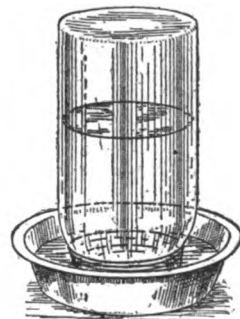


FIG. 219. Drinking fountain made of a tin base and a preserve jar.

218), boxes, or any handy vessel. Spread the grain an inch or so deep, sprinkle and keep it in a warm place, feeding it while the sprouts are soft and tender.

For fattening purposes, add more corn to the grain mixture, or give one full meal of cracked corn daily, preferably in the evening. Cornmeal may be added to the mash, which for fattening may be fed wet instead of dry. If fed wet, use water or better still milk, just enough to make a crumbly mass.

Cheap rations for the farm flock. Very small flocks may be fed entirely on table scraps, 5 ounces of such food per day being enough to keep a hen in good laying condition. Small potatoes or peelings, vegetables and their tops, cut in small pieces and cooked with the scraps are excellent; such feed mixed with enough meal or grain to make it dry, is even better. Kafir corn, millet and speltz, though not as good as other grains, can be fed to hens, the speltz being more digestible if boiled or steamed and fed warm, not hot. When beans, peas, and wheat are threshed, considerable grain is wasted which can be saved and fed to the flock. It is usually mixed with the chaff or hulls that collect under and about the machine all of which may be gathered in sacks and stored under shelter for winter use. On the whole, fowls can be fed anything fit for a cow or a horse, except salt. More than an ounce to 10 pounds of mash, and salt meat or fish fed to any extent, will kill chickens, ducks, geese, or turkeys.

How to Market Surplus Stock

There is no economy in feeding fowls not needed for breeding or egg production beyond the time when they can be sold at a profit. Cockerels first reach a marketable condition and will bring the most profit if sold as broilers as soon as they weigh about 2 pounds. Little or no profit is possible on the ordinary farm from the special feeding of broilers. This is difficult work, for the birds must be milk-fed, and only persons with considerable experience and the right equipment can succeed. If the chicks are well fed from the time they are hatched as above directed, the broilers will be plump and juicy and bring the best price possible with the least trouble and expense.

The production of roasters and capons is also a special branch of the poultry business, rarely profitable in connection with the farm flock. Almost any one can raise a few but special facilities are required to produce any considerable number. The best plan in caring for farm flocks is to feed the fowls liberally, select the pullets and cockerels to be used for breeding, and place them by themselves, then sell the rest of the stock whenever opportunity offers.

Killing for Home and Market

The most common method of killing fowls on the farm is either to wring their necks or to cut off their heads with a sharp knife, hatchet, or axe. Other and better ways are the bloodless method, and sticking through the roof of the mouth.

The bloodless method is one of the most

satisfactory ways of killing chickens for immediate use; it can be done quickly and without soiling the hands or clothing. In using it, grasp the shanks in the left hand, holding the fowl head downward, and the head between the first and second fingers of the right hand; with a quick jerk dislocate the head from the vertebrae (neck bones); then, with a little pull, separate the head and vertebrae by about an inch—not more—thus breaking the arteries in the neck and permitting the blood to flow down into the opening inside the neck, but leaving the skin whole and clean. When killing this way begin to dry pick immediately, pulling all the feathers in a direction away from the feet, a very few at a time.

Killing through the mouth. This is perhaps the most common of the modern methods



FIG. 220. The bloodless method of killing poultry



FIG. 221. Sticking poultry. *a* cutting the jugular vein; *b* piercing the brain.

ally toward the right and then toward the left so as to cut the veins in both sides of the neck. Just as soon as the blood begins to flow freely from the mouth, withdraw and turn the knife, direct the point into the curve in the roof of the mouth just below the ear lobe and back of the eye, turn it downward slightly, and push it straight back until it enters the brain. When this occurs the fowl will give a squawk and begin to have violent convulsions, these proving that the brain has been punctured and that the bird is insensible

and practically dead. Finally twist the knife so as to destroy some of the brain tissue.

Dry picking. Fowls killed by the sticking method and all poultry intended for cold storage must be dry picked. Birds so dressed keep in good condition longer than any others.

Dry picking must begin immediately after the knife has severed the arteries and punctured the brain. The fowl should be hung where it cannot be bruised by swinging against any hard substance. Sometimes



FIG. 222. A fowl hung for plucking, with blood cup hooked to its mouth.

and the best when fowls are to be shipped or kept at home or in storage for any length of time. In this method, suspend the fowl by the feet from a wire or a strong string; hold its head throat upward with the thumb and fingers of the left hand; press on each side of the beak till it opens, and insert the knife into the mouth and up through the opening in the centre of the roof until the point of the blade reaches the point indicated in the illustration. Hold the point close to the skin of the neck above the veins and the arteries, then draw the knife diagonally

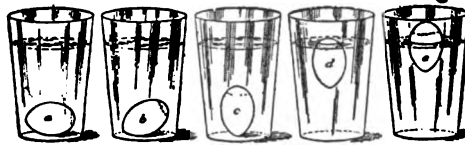


FIG. 223. Simple test for fresh eggs. *a* fresh; *b* 1 to 3 weeks; *c* 1 to 3 months; *d* and *e* 5 months or over. The dotted lines show the gradually increasing size of the air space.

it is hung low enough so that the head is inside a box or can that catches the blood; sometimes a small can like a baking powder tin with a sharp wire hook attached is hooked into the mouth to catch the blood and keep the feathers clean.

Pull the feathers in the direction from the tail to the head removing first those on the tenderest parts of the body, where the skin is most likely to break. The approved order of plucking is breast, back, neck, shoulders, thighs, and last, wings and tail. The secret of success is to get the feathers off quickly while the fowl is dying; after death the muscles contract and grip them. Keep a pail of water near by so that every now and then

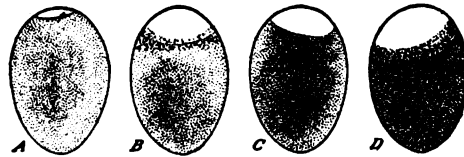


FIG. 224. As they appear when candled: *a* fresh egg; *b* stale, shrunken egg; *c* lungous or "spot" egg; *d* black or rotten egg.

the fingers can be dipped to give a firmer grip.

Scalding. Fowls intended for immediate use at home or for sale nearby may be scalded to make the plucking easier. To scald well, hold the carcass by the head and feet and dip it into water at about 200 degrees F. Take the temperature with a thermometer for the water must be neither too hot nor too cold. Dip once or oftener, according to the size and age of the fowl and the density of the feathers. The carcass of a scalded fowl will not look so well an hour or so after picking as that of a fowl dry picked.

In all picking, whether the carcass hangs by the feet or is held on the knees, it should be firmly grasped with the left hand and the skin drawn tightly over the part being picked by bending the head backward or forward, ac-

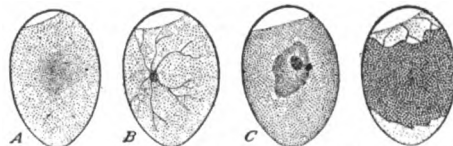


FIG. 225. Candled eggs from the incubator: *a* infertile, 6 days; *b* fertile, 6 days; *c* dead germ, 6 days; *d* fertile, 10-12 days.



FIG. 226. One way to candle eggs

absolutely clean, put the carcass in cold water—ice water preferably—and leave it until cooled all through.

Eggs for Market

Fresh laid eggs are the market standard. If, in addition to being fresh, all the eggs in a shipment are of the same size and color, or at any rate present a uniform appearance, and are smooth and clean, they are likely to bring the maximum price; if uneven in size or color, rough of shell, or soiled, their value diminishes accordingly. If the nests are protected, eggs laid in them will be clean; if the nests are dirty, the shells will be soiled, and the eggs automatically thrown into a lower class. No other food product comes into existence as pure and clean as an egg, and it should be kept in that condition; when once the shells are soiled, contamination soon enters through the pores, and the egg at once begins to spoil.

Great care should be given to the gathering of the eggs at regular intervals; twice a day is never too often, and three times is better in very hot or very cold weather. An egg spoils quickly if either overheated or slightly frozen. When sent to market, too, the eggs should be protected from the direct rays of the sun in warm weather, and from cold in the winter. A clean, attractive package adds much more to the market value of the eggs than it costs in either money or trouble.

Candling is simply the operation of looking through an egg held up against a strong light in order to determine its quality and condition. It is generally done from the fifth to the eighth day after starting a hatch to locate the infertile eggs; and again about the sixteenth day to locate

cording as the feathers are being pulled from the front or the back.

As soon as the feathers have been removed, submerge the carcass in cold water (unless it can be chilled in cold air) wash away all blood stains and thoroughly clean the head, legs, and feet. When

eggs with dead germs. Market eggs, except those of the highest, guaranteed grades, are candled by the wholesale dealers, but rarely by the small farmer. At the same time it is a good thing for every poultryman to know how eggs of different ages and conditions look.

While special lamps and shields for candling can be bought, any good lamp or electric light bulb in a tight shoebox with a hole cut in the side will do; some poultrymen prefer a sheet of heavy paper rolled into a long tube, one end of which is placed against the eye while the egg is held against the other; a still simpler method is to hold the egg up toward the sun with one hand or both hands so as to let most of the light shine through it.

How to Preserve Eggs

Eggs will keep good for food for a year, in a solution of water glass but it is not advisable to try to keep them longer than that. The solution is made of 1 part of water glass (*sodium silicate*) which may be bought at the drugstore as a yellowish, syrupy liquid (or in powder form) and 9 parts of warm water, preferably water that has been boiled. A 5-gallon crock or butter tub will hold about 200 eggs and the 10 quarts or so of solution needed to cover them. The solution should be cold when poured over the eggs and should cover those on top to the depth of at least an inch. Or it may be put in the vessel and the eggs added as gathered until they come to within an inch of the surface. Keep the container closely covered and in a cool place; add a little of the solution to balance any evaporation.

Only clean, fresh, sound eggs should be preserved; those laid in April and May are best but those laid at any time when the temperature is below 70 degrees will do. Infertile eggs will keep longer than those that are fertile. Preserved eggs may be cooked in any way, but if to be boiled, a few pin holes should be made in them to prevent their breaking.

Eggs keep well for several months packed in salt in a cool place. Vast numbers are kept, commercially, in cold storage, and some poultrymen within easy reach of storage houses that rent space, send in crates of eggs in spring when prices are low, to be held for them until winter, or the season of greatest scarcity. The charge for such storage averages about 50 cents per 30-dozen crate.

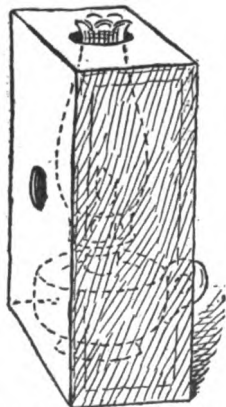


FIG. 227. How a candler can be made from a shoe box.

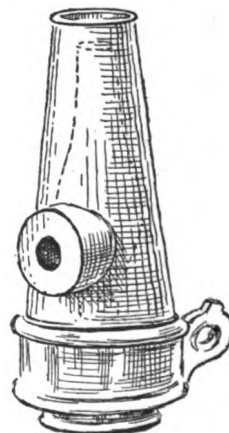


FIG. 228. Metal candler in place on a lamp

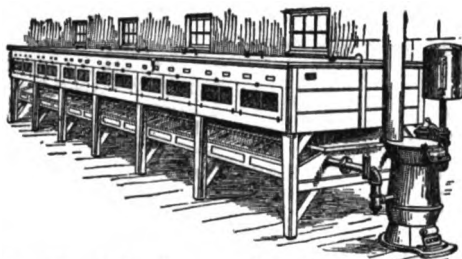


FIG. 229. A 12-unit mammoth incubator heated by the coal-burning, hot water heater in the foreground

CHAPTER 19

Commercial Poultry Production

By ROLLA C. LAWRY, Manager of the Yesterlaid Egg Farms Company, Pacific, Mo., one of the largest, most progressive, and most successful poultry plants in the country. Eastern poultrymen will remember Mr. Lawry as a highly efficient Instructor in the Poultry Husbandry Department of Cornell University, where he cooperated in the invention and improvement of a number of labor-saving devices for the poultry raiser. The commercial poultryman must be a specialist, an expert, a scientist, and a business man of ability. He must invest plenty of capital, study, and hard work in his business, along the lines described by Mr. Lawry. One of the surest roads to success is a gradual development from the care of a small flock to the management of a high quality, large scale enterprise. —EDITOR.

OF THE thousands of persons who engage in poultry raising in this country, only comparatively few conduct what in strict terms can be termed commercial poultry plants, or commercial farms. The majority, including a large number of farmers, and practically all town and city families who keep small flocks in their back yards, breed, grow, and keep only enough poultry to supply eggs and meat fowls for their own home needs. In a general sense, any person keeping a large or small flock of poultry and selling all or a part of the produce is in the field of commercial poultry production. The sum total of surplus eggs and meat poultry sold annually from the farms of this country represents a value of many millions of dollars, and is the chief source of these products for our large food-consuming public. Strictly speaking, however, commercial poultry production is the producing of eggs, meat poultry, or baby chicks for wholesale market purposes. When food purposes are considered, the last of these must be omitted, yet the production, sale, and shipment of baby chicks during the past decade has developed to such proportions, and has become so popular with poultry raisers in general that this phase of the industry has attained great commercial importance, and no doubt will continue to increase in volume and popularity.

To meet the steadily increasing demands of the increased city population, and attracted by the higher prices for eggs and meat poultry, a large number of widely distributed commercial poultry farms have come into existence in the United States. On these farms poultry raising is not a side line, but a specialty—the main or only line of production. On some specialized plants a good part of the feed for the birds is raised, but on the majority of these farms almost all, if not all feed (except a limited yard or pasture range of green forage) is purchased. All of the energy of the farm is devoted directly to the production of poultry or eggs.

Three Kinds of Commercial Poultry Farm

Commercial poultry farms are of three general classes: (1) those that keep no breeding stock and produce no new stock of their own, but purchase every year from other breeders either eggs or newly hatched chicks for the replenishing of their flock; (2) those that keep special breeding birds to replenish their flocks; and (3) those that each year go back and purchase new males of quality from other noted breeders to cross with their own selected hens.

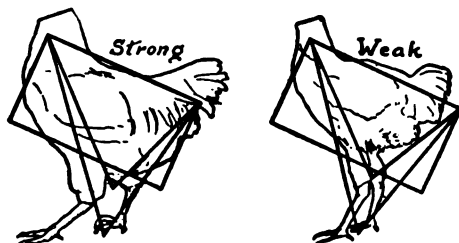


FIG. 230. How typical birds of weak and strong vitality differ. Note how the strong one fills the oblong and triangles. (N. Y. State Dept. of Agr. Bulletin 65).

The advantages gained by those in the first class are that they do away with the equipment and expense of breeding pens and the labor of caring for them; save their own eggs for selling and filling large orders promptly; save equipment, labor, and time required for incubating and brooding chicks; and can purchase uniform flocks as desired, either as baby chicks or older birds. This class of farm is found in the neighborhood of large cities, where facilities for easy, quick marketing are good, markets plentiful and prices constant and very attractive.

The advantage enjoyed by growers of the second class is that they can lay plans for uniformity of breed for meat poultry or egg production and work toward that goal with considerable certainty of success. Many meat poultry farms are in this class since by raising their own birds from eggs obtained from their own breeding pens they can produce the special class of dressed birds best suited to their particular trade. For example, to secure large dressed carcasses of good flavor and attractive appearance, Brahma cocks are commonly crossed with White Plymouth Rock females, or other equally large cocks with some other general purpose bred hens. Poultry growers of the third class reproduce their flocks by repeated infusions of new blood, gaining the well known benefits of the first cross, but running the risk of getting an ununiform flock.

It should be understood, however, that all commercial poultry plants, whether specializing on meat poultry or eggs, produce and sell both meat poultry and eggs to some extent. On the meat poultry plant, surplus eggs are sold; on the special egg farm, young cockerels are fattened quickly and sold to the general market, as are old, cull female birds past the useful producing age. Many commercial poultry farms keep only purebred birds of merit, which enables them to sell, at all times, eggs for hatching purposes, baby chicks, and high grade mature breeding birds, at higher prices than those obtained for general market produce. The premium depends upon the merit and popularity of the stock and the reputation of the breeder. Special ability on the part of the owner or manager and extra expense for advertising are required in successfully handling high class breeding stock and eggs for mail order trade.

Large Scale Incubation

On all commercial plants where chicks are hatched to replenish the flock, incubation is perhaps one of the most important, and the most intricate, of operations. Equipment and management must be of the very best to hatch successfully large numbers of chicks at a given date in late winter or early spring. In view of the great value of the large number of eggs consigned for hatching, the pressing need of a large number of chicks at a given date, and the value of trade and reputation gained by being able to fill all orders promptly with the correct grade of produce, it is poor management to use cheap equipment or cheap, unskilled labor.

Incubation systems. Two general methods of incubation are employed on large commercial poultry farms. One makes use of several small or medium sized incubators in a special cellar or house. The other uses the so-called mam-



FIG. 231. Four chicks from the same hatch showing how individuals differ as to vitality and rate of growth. (N. Y. State Dept. of Agr. Bulletin 65).

moth incubator, which is a single, large, long machine on the continuous unit plan, warmed by a single heating plant. Both systems have their peculiar merits, and each poultryman must decide for himself which is the better suited to his special conditions. The tendency at present indicates preference for the larger type, economy of operation being a factor in its favor.

Eggs for hatching. The best hatches are secured with new, clean eggs. By new eggs is meant eggs not more than a week old. All experienced poultrymen are united in the opinion that the newer the eggs the better the hatch, always. Eggs, *if kept under ideal conditions*, will hatch when several weeks old, but as a rule eggs kept for more than 2 weeks are of uncertain value for hatching purposes and their use is not good practice. During cold weather hatching eggs should be gathered at least twice daily to prevent chilling, and kept in a room reasonably clean, free from excessive dampness, foul odors, and mildew, moderately ventilated. The air must be pure and the temperature between 50 and 70 degrees F., 60 being the most desirable point. It is best to keep such eggs in standard 30-dozen egg cases, with the small ends down in the fillers. To prevent the yolks from rising, turn the cases from side to side, and reverse, daily. If they are kept in trays, turn the whole tray once a day.

In filling an incubator with several thousand eggs it is difficult if not impossible to secure eggs all of uniform size, shape, thickness of shell—what might be called “ideal” hatching eggs. While it is preferable to do so, it is not at all necessary, for it has been found both by tests, and in general practice, that imperfectly shaped eggs of large and small sizes and thick and thin shells hatch out a relatively large percentage of strong chicks. The danger lies in the fact that incubating any but the most perfect eggs is likely to reproduce the habit of producing eggs with undesirable shells. That is, the poor shaped, poor shelled eggs may have been laid by hens in whom the character of producing such eggs is dominant, in which case chicks hatched from these eggs might at maturity show a similar tendency to lay eggs of poor shape. Then, too, eggs of different sizes and thicknesses of shell do not respond to the heat of the incubator so evenly as more uniform eggs. No egg excessively soiled in the nest should be used for incubation. Best results are secured where no cleaning at all is required.



FIG. 232. Two ways to pack hatching eggs for shipping. The basket often insures careful handling. (Canada Dept. of Agr. Bulletin 88)

Incubator Management

Filling the incubator. Before the incubator is filled the first time each season, it must be gone over thoroughly to locate defects, and necessary repairs. Clean well and disinfect at this time, although it is very important to clean and thoroughly disinfect also after each hatch is removed. Germs of all kinds readily gain access to the incubator chambers, and lingering there may easily be taken up by the following hatch.

The incubator should always be warmed for a few days or until the attendant is satisfied that it is working perfectly, and a steady, normal heat is being maintained. Then the eggs may be put in it. Morning is considered the best time to do this. Whenever cold eggs

are placed in an incubator, the temperature of the chamber suddenly drops very low and remains so for from 8 to 12 hours, because the mass of eggs quickly absorbs the interior heat and all heat produced by the heating apparatus for a long time. But neither the regulator nor the temperature of the machine must be tampered with during the first day, nor until the interior temperature rises to normal. After that if the chamber temperature is either too high or too low, the fire and regulator may be adjusted accordingly.

Temperatures and thermometers. Constancy of chamber temperature is a very important factor in securing a good hatch. General practice and experimental data point to the fact that 101 to 102 degrees of heat, with the thermometer lying on live eggs, gives



FIG. 233. The head of the rooster shows vigor, vitality, and masculinity. That of the capon beside it shows the dwarfed comb, wattles and ear lobes, and a general appearance of sluggishness and loss of character. (N. Y. State Dept. of Agr. Bulletin 65).

better hatches than either higher or lower temperatures. It is best to maintain this, continuously and evenly, with as small fluctuations as possible, all through the incubation period.

The air of the incubator chamber is in layers or strata, the warmest at the top. Some types of machine use the hanging or suspended thermometer of which the bulb is about one inch above the eggs and which therefore shows a greater degree of heat than that of the eggs; it will also show a gradual increase of temperature (from 101½ to 104 degrees) from the beginning to the end of the hatch, because the air in the chamber gradually receives more heat from the eggs as the live chicks develop within them. That is, the air in the incubating chamber near the close of the hatch is heated by two sources, namely, the lamp or stove and the warm bodies of the developing, unhatched chicks.

Because the height and constancy of the temperature of the egg chamber during a hatch are so important, it is best to use a thermometer of the highest grade that has been thoroughly tested and found to be delicately accurate. Since glass, like many other materials, "seasons" or shrinks with age, it is well to test and standardize each thermometer after the first season's use, by comparing it with a clinical or physician's thermometer.

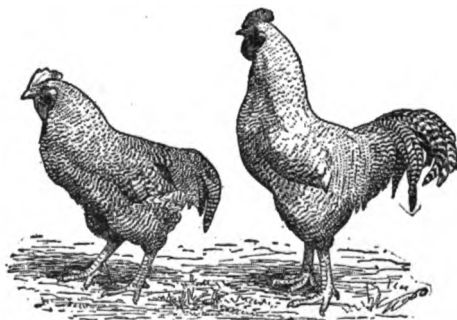


FIG. 234. The carriage, position of the tail, and general expression mark the rooster of low vitality (left), from that of high vitality (right). (N. Y. State Dept. of Agriculture Bulletin 65).

To do this provide a shallow basin of water heated to 110 degrees F., and place the standardized thermometer and the one to be tested side by side in the water, with the mercury bulbs about one inch below the surface. Compare the two as the water cools to 96 degrees, note their comparative readings, then indicate any corrections called for on the incubator thermometer.

Care of the eggs. In the case of incubators heated by oil burners take care in handling lamps, that no oil gets on the egg shells. To do this (1) observe the lamp and read the temperature before opening the door of the chamber, (2) make any required change in the regulator, (3) open the door and turn the eggs, and (4) attend to the lamp. *Care of the oil lamp last*, is the rule.

Many poultrymen do not consider turning and cooling the eggs necessary till after the third or fourth day, though the general practice is to turn the second day after putting them in; thereafter they are turned twice daily. If the ventilation of the incubator is perfect

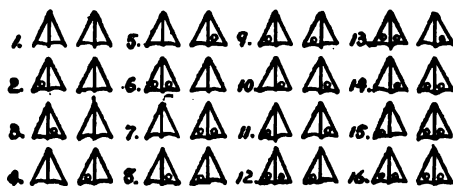


FIG. 235. One way to number chicks or hatches. Other combinations can be made by cutting out the whole web, or removing different toes.

the proper airing of the eggs is accomplished within the chamber with the door closed. Excessive ventilation dries them out, and wastes moisture given off by them, which is a prime factor in securing a large hatch. A good hatch is always accompanied by good moisture conditions in the chamber which are indicated by the formation of moisture on the glass of the door. Since all the moisture necessary for a good hatch may be supplied by the incubating eggs themselves (if proper ventilation is assured) a good test for ventilation or moisture loss consists of weighing 12 representative eggs of the hatch on the 6th, 12th, and 18th days. The loss of weight in a dozen eggs weighing 24 to 25 ounces at first should be, on the 6th day, approximately 1.2 ounces; on the 12th day, 2.4 ounces; and on the 18th day 3.4 ounces, or approximately 14 per cent. The details of controlling ventilation must be patiently worked out by the attendant himself according to the needs of his machine, the weather, building conditions and other factors, which cannot be foretold. In other words, he must be a person of skill and resourcefulness, quick to locate and correct trouble with his machine. On a basis of 100,000 eggs incubated, a hatch of 50 to 60 per cent may be obtained from white-shelled eggs and one of 40 to 45 per cent from brown-shelled eggs.

Care of the Chicks

Chicks should be left in the incubator till the hatch is complete, then removed to chick boxes—such as are used for the shipment of day old chicks—where they remain wholly undisturbed for 48 hours. Here, in a warm, quiet room, they simply rest and gain strength by absorbing the egg yolk, which is their first food and drink. If they become restless, they are either too hot, too cold, or have not enough air, conditions which can easily be remedied after a few minutes' observation. It is not a good plan to allow chicks to remain in the warm incubator chamber for the first 48 hours after hatching, as they will crowd to the light and some will be smothered and others injured.

Brooding. When baby chicks are ready for the brooder, it is best to place them in it late in the evening or at night, the brooder having previously been heated to 100 degrees F. After the chicks are in the brooder hover, the attendant should remain till all are asleep and quiet. No feed or water is supplied at this time. Chickens are creatures of habit, and it is considered best to allow them in this first stage of life to become used to the hover, to which they will then by habit return whenever tired or cold.

The morning after placing the chicks in the brooder give them their first feed and drink and see to it that every chick of the brood immediately learns to eat and drink; teach the slow ones. Do not give chicks brooded indoors grain feed at first, but feed them 5 times daily for the first week on bread crumbs or cracker crumbs, or one of the several "chick starting" foods now on the market. More rapid gains will be made if these feeds are slightly moistened with warm water or skim milk. Feed only as much at a time as will be cleaned up quickly and eagerly in long, shallow pans or on a flat surface. The drinking vessel should be elevated and arranged so that the chicks cannot get into, or scratch litter into the water.

After the first week the brooder chicks' rations may be reduced to 4 feeds daily, and the feed may consist of small cracked grains or some good commercial chick feeds. When the chicks are 3 weeks old, 3 feeds daily are sufficient, 2 of cracked grain and one of moistened bread crumbs or prepared, cooked chick feed. Some poultrymen still stick to the practice of feeding brooder chicks nothing but dry cracked grains or dry meals until they are 4 to 6 weeks old, but this system does not produce as rapid growth of the brood as a whole, or develop as many of the weaker chicks, as the early use of moistened mash.

Separating the sexes. In the egg breeds (Leghorns, Anconas, Minorcas, etc.) the sexes of the chicks can easily be distinguished at 6 weeks of age, when they can be separated, and the cockerels placed in separate flocks and fed quick-growing and fattening foods for rapid broiler development. At the earliest possible age pullets also are placed by themselves on range to be developed into laying stock. In the heavier breeds the sexes cannot be easily distinguished at an early age, but early enough to make friers of the cockerels. Some poultry-



FIG. 236. A good metal drinking fountain for chicks

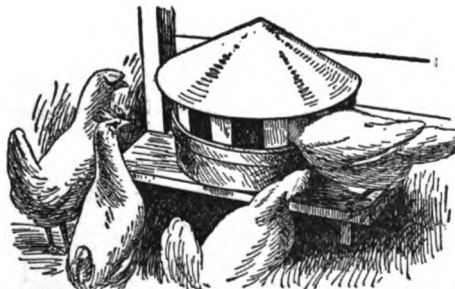


FIG. 237. Drinking fountains whether of wood or metal should be elevated and protected so the birds cannot get into them.

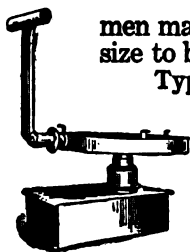


FIG. 238. Gasoline-burning brooder designed for use in the brooder house shown in Fig. 239. (N. Y. [Cornell] Bulletin 246).

men make capons of their heavier breed cockerels and grow them to large size to be sold the following winter.

Types of brooders. It goes without saying that commercial poultrymen are anxious to keep alive and grow to market size or maturity as many as possible of the chicks they hatch. Some find it comparatively easy to run incubators and bring off relatively large hatches, but more difficult to keep alive and develop the chicks hatched. Because artificial brooding is not easy, to say the least, different systems of artificial brooding have been invented, of which there are 3 leading types.

One of these makes use of the long brooder divided into sections or series of hovers and runs, each hover and connecting run holding from 50 to 100 chicks, and the whole series of hovers being heated by one continuous hot water system. A second type uses a long house divided into compartments and connecting runs, and a lamp brooder in each compartment. A third type, and one rapidly gaining in popular favor, uses a coal-burning brooder stove provided with a large, metal, cone-shaped canopy, under which the chicks hover for warmth. This comparatively new and successful brooder placed in a colony house 8 to 12 feet square, provides quarters for from 400 to 1,000 chicks. Its advantages are: (1) that a larger number can be brooded in one place, (2) a large flock of uniform size can be quickly placed outside, (3) pullets can be left in the colony house after the separation and removal of cockerels, (4) the equipment is comparatively cheap and easy of operation, and (5) fuel and labor are saved.

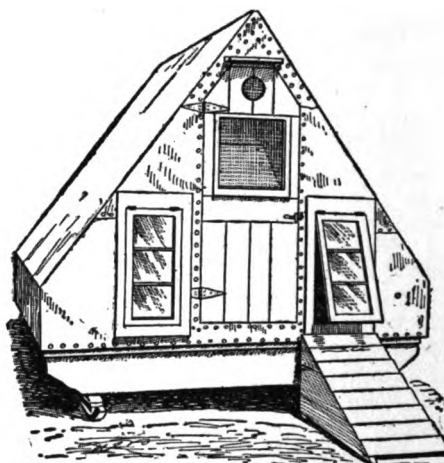


FIG. 239. Combined colony and brooder house built on runners so it can be moved. (N. Y. [Cornell] Bulletin 246).

Developing Breeding and Market Stock

In the case of commercial poultrymen who produce breeding stock for their own farms or for sale, it is important to select and put by themselves promising breeding birds at a comparatively early age. Both cockerels and pullets grow and develop better when separated and confined by themselves than when allowed to run together in large flocks. The most virile breeding cockerels are produced by putting the chosen birds in individual pens after they begin to crow. Good grain and mash mixtures for growing cockerels and pullets are:

GRAIN

30 pounds corn; cracked corn or Kafir
50 " wheat
20 " oats

MASH

25 pounds middlings 10 pounds alfalfa flour
25 " cornmeal 10 " meat scrap
15 " bran 1 " charcoal
½ pound salt

Feeding for market. All meat poultry, live or dressed, sold to the wholesale trade must be in prime, fat condition to command the highest market prices, and

bring the producer the most revenue. It is fattened by confining the birds in small pens or crates, where they are fed on a batter or thin mash, rich in cornmeal, wheat middlings, and oats. Proprietary preparations of buttermilk and sassafras oil in jelly-like or condensed form, are rapidly gaining favor as supplements to the regular ground grain batter. Sassafras oil stimulates the appetite, is an alterative and blood purifier, and gives a healthy glow to comb and wattles. Representative meal mixtures for poultry fattening to be mixed to the consistency of thin spoon batter with fresh or

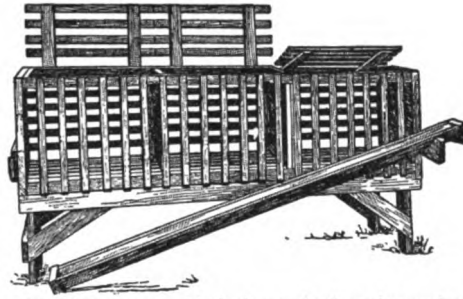


FIG. 240. Farm made feed crate for fattening poultry. Note the removable feed trough (Canada Dept. of Agr. Bulletin 88).

prepared buttermilk or skimmilk, are:

FOR YELLOW FAT

30 pounds	cornmeal
30 "	ground oats
30 "	flour middlings
10 "	meat meal

FOR LIGHT FAT

25 pounds	ground barley
25 "	ground oats
40 "	flour middlings
10 "	meat meal

Birds being fattened for market are confined in a shady or moderately lighted place, where it is quiet and cool in warm weather; are given no water, except that mixed with their feed; and are fed all of the fattening mixture they will eat twice daily. The feeding is continued from 7 days to 14 days and the birds are promptly marketed when they reach maximum flesh. If the feeding is continued too long, they lose appetite or "go off feed" and lose flesh rapidly. Experience will teach the feeder the time to market individual birds, which is just before the "edge of the appetite" begins to wear off.

Killing. Market poultry is sold either alive or killed and dressed. The latter must be done with skill and according to approved methods demanded by dealers where the best prices are paid. Before killing, all market birds should be kept without food for 24 hours. Whether broilers, roasters, or capons, meat

poultry is best killed by sticking to paralyze the brain and cutting the blood vessels in the neck to cause bleeding from the mouth (p. 195). The bird is then immediately picked clean. Birds keep better if dry picked than if scalded, since in the latter process water soaks into the skin and makes it more liable to spoil. Dry picked poultry also has a firmer, more attractive skin, which appeals to the dealer and ultimate consumer, and a plumper appearance which it retains longer.

To scald poultry have the water just below the boiling point, pick the legs and neck dry, hold by head and legs and dip 3 times. If the head and legs are not scalded the fowl will present a much better appearance. Remove feathers and pin-feathers immediately and thoroughly, being care-



FIG. 241. Automatic feed hopper. By pecking at the hanging ear of corn the fowls cause some grain to fall out of the hopper.

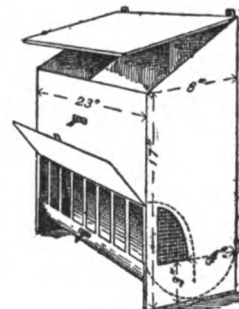


FIG. 242. Rat proof feed hopper of galvanized iron. The end openings are covered with wire netting and the front by the hinged lid which is hooked up during the day. (N. Y. [Cornell] Bulletin 284).

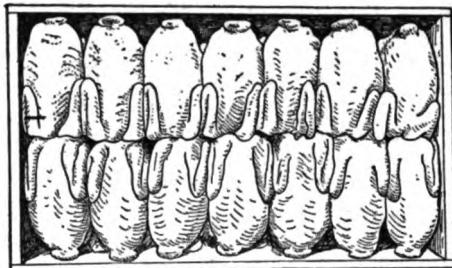


FIG. 243. Careful packing of a uniform product brings the best prices. (Canada Dept. of Agr. Bulletin 88)

to furnish the hens an abundance and variety of feeds containing elements and compounds that maintain their bodies and make eggs. As eggs are composed largely of water, plenty of fresh water at all times is as important as enough feed of the right kind.

Since chickens have no teeth, they must always have plenty of grit. This generally should be of two kinds—cracked oyster shells and broken rock. Large commercial flocks will consume enormous quantities of both, especially when laying heavily. For the formation of egg shells, the laying flock must always be supplied with plenty of mineral matter such as crushed oyster shells.

Laying hens must be kept busy, and for this reason should be fed grain in the scratching litter, especially when confined in cold weather. It is well to give the flock a small mixed grain feed at noon and another heavier grain feed rather early in the evening. A small amount of this will be left in the litter to be found by the birds coming off the perches early in the morning, and will keep them busy and happy till the regular morning feeding.

In addition to the mixed grain feed given in the litter on the poultry house floor to be scratched out three times daily, commercial poultrymen provide a large self-feeding hopper in each laying house, from which the hens may secure feed at will. The mixture kept in the hopper is changed from season to season, according to the make up of the grain fed and the kind and amount of green fodder the hens are securing on the range.

1. { 20 pounds Kafir
20 " wheat
30 " cracked corn
15 " oats
10 " barley
5 " sunflower seed (when obtainable)
2. { 60 pounds wheat
30 " corn
10 " oats

ful to avoid breaking the skin, then "plump" the carcass by dipping it for 10 seconds in water just under the boiling point, and then into cold water for 10 minutes.

Commercial Egg Production

Feeding for the highest egg production is an art demanding skill, time, and perseverance; it cannot be learned in one day, or one year. The chief essential is

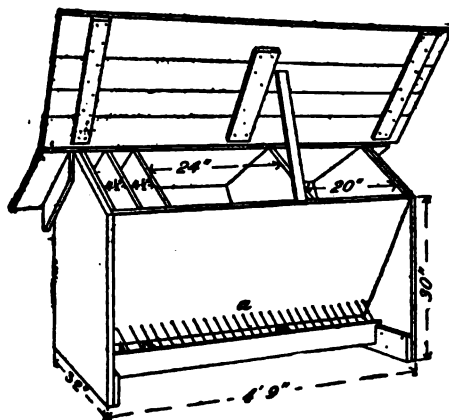


FIG. 244. Wooden, outdoor self-feeder for 2 kinds of grain, grit, and shell. The overhanging roof keeps the rain out of the feed trough and the wires (a) prevent the wasting of the feed. (N. Y. [Cornell] Bulletin 284).

Typical rations for laying hens are:

The following meal mixture for laying hens may be used in a self-feeder or fed moistened:

- 24 pounds middlings
- 24 " bran
- 24 " cornmeal
- 15 " alfalfa flour
- 10 pounds meat scrap
- 1.5 " old process oil meal
1. pound charcoal
1. " salt

Marketing Eggs

A vital phase of commercial egg farming consists of marketing the eggs so that the highest possible market price, and a premium as well, may be obtained for them. Almost every one is familiar with the manner in which common market eggs are produced—carelessly gathered and kept at home, and finally sold or traded, in all sizes, shapes, colors, ages, and degrees of cleanliness to the local town merchant. He keeps them a week or more, often in an unfavorable atmosphere and under unsanitary conditions, and finally ships them to some wholesale commission merchant. Naturally, the commission man receives many cases of "common" to poor and very bad eggs which he candles and grades, paying the town merchant only what the eggs are actually worth—that is, the good ones less all spoiled and inferior ones. Thus, so-called "common market eggs" sell for several cents less per dozen on the average than the trade is willing to pay for strictly guaranteed fresh, or good eggs.

There are good markets for uniformly good eggs where the premium on the higher grades is from 5 to 25 cents per dozen. All commercial poultrymen seek such markets, but to obtain and hold a high class trade the poultryman must ship only eggs of positive freshness, reasonably uniform in size and color, clean, and attractively packed.

Gathering, grading, and packing. Eggs to meet the highest market demands must be carefully gathered daily, or twice daily in hot weather, and held on the farm in a cool, dry, well ventilated room, free from other foods and contaminating odors. The shell is porous, and the egg quickly absorbs and is tainted

by any of a wide variety of odors. Keep out for home use or other purposes all eggs of abnormal size and shape, and carefully clean (without wetting) all soiled ones. Uniformity of any kind is considered a mark of quality in food and other products, and is paid for accordingly.

In order that commission merchants may quickly identify every shipment of eggs from any one farm, it is good business policy for the manager or owner to interview personally the merchants to whom he consigns eggs, informing them of the good quality of his product, etc. When this is not convenient or possible, the same information can be given by letter or printed circular. In other words, the commercial poultryman must advertise to secure the premiums his goods deserve. (See Marketing, Vol. IV.)

In establishing and maintaining a market for high class eggs, give careful attention to packages, packing, and shipping. For best results pack in cartons holding one dozen each (which are relatively cheap if purchased in quantity), and these in standard 30-dozen wooden cases. The cartons should bear the trade-mark or name of the farm with other appropriate and attractive printed matter; it is a good plan also to place a small printed slip inside each sealed carton telling how good eggs are produced and handled and explaining briefly the difference between them and inferior eggs. The sealed carton should be the producer's guarantee of quality which merchants and consumers will soon come to recognize and ask for. Having thus established a good trade, it is essential to maintain the high standard and never allow a single bad egg to go out in any shipment.

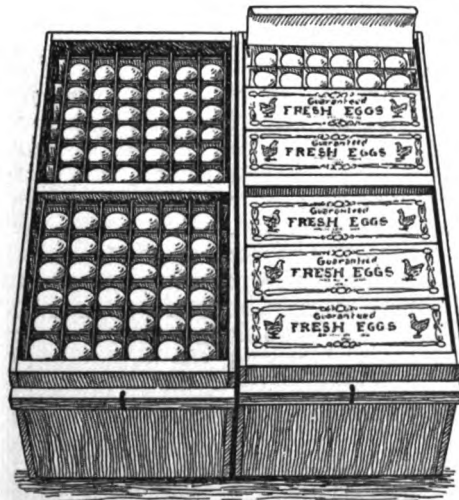


FIG. 245. Two types of 30-dozen egg crates, one using cardboard separators and the other cartons holding a dozen each.

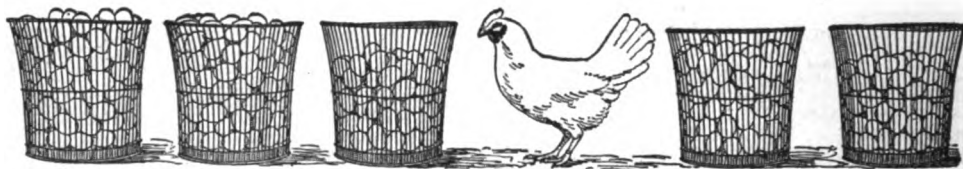


FIG. 246. Consistent, long distance efficiency as a result of careful breeding and selection. A prize Leghorn of the Utah Agricultural College and her output for 5 consecutive years. The eggs totalled 816, weighed 107 pounds and at 35 cents a dozen would have brought \$23.80. The hen weighed 3½ pounds and the cost of her feed for the 5 years was \$6.25.

CHAPTER 20

Poultry Breeds and Principles of Breeding. Poultry Industry Statistics

I. TYPES AND BREEDS OF DOMESTIC FOWL

By F. H. VALENTINE, whose experience has included a good many years of farm work, some seasons of rural school teaching, 10 years of agricultural editorial work, and constant interest in, and connection with, poultry raising and allied activities.—EDITOR.

DOMESTIC fowl may be grouped or classified by any of several systems. For instance, there are the utility breeds, raised to supply market poultry and eggs; and the ornamental breeds, raised only for show and competition. This cyclopedia discusses in detail only the first of these, the practical group. Then there are (1) the layers or egg-producing type, (2) the meat type, and (3) the general-purpose type combining both egg and meat-making abilities. The breeds may also be grouped according to the parts of the world in which they originated. That is as American, English, French, Mediterranean, and Asiatic breeds; also according to the color of their skin, the color of their eggs, etc. These and other characteristics for each of the breeds are given in the accompanying table. Each breed includes one or more varieties which differ from one another mainly as to color and type of comb; but occasionally as to body form. Superior usefulness, quality, etc., are also claimed usually for their favorites by originators and breeders of particular varieties.

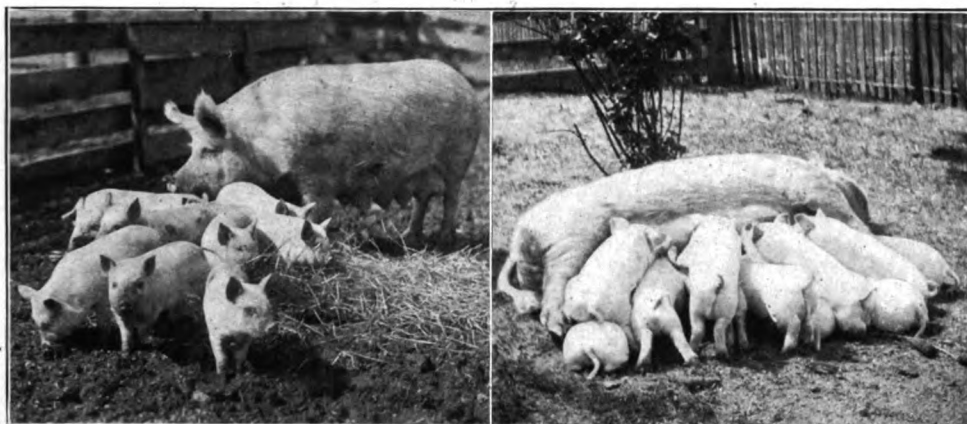
As with other farm animals, there are two standards for judging and rating fowl: (1) the performance standard in which vigor, egg production, size, and development of carcass are the most important points; and (2) the show standard in which trueness to a type and correctness of color and markings are given first consideration. The most successful poultrymen, who patronize the shows to advertise their birds but who depend for their income mainly on market stock, will keep both sets of requirements in mind. But the average, small poultry raiser who wants mainly to secure eggs, broilers, and roasters will be safest if he stays out of the risky and often costly show business and gives his time and effort to producing strong, healthy, productive birds of a popular, time-tried breed. Furthermore, let him resist both of two dangerous tendencies: first the desire to keep more than one breed; and, second, the temptation to keep anything but purebred stock. There is no economy in scrubs. There is nothing "just as good" as pure blood; it makes for uniformity, productiveness, size, reputation, gross returns, and net profits.

Utility Breeds and Their Varieties

Ancona. Much like the Leghorn (p. 210). Plumage mainly black, about 1 feather in 5

being tipped with white; under color dark slate. Varieties: *Roses* and *Single Comb*, otherwise alike.

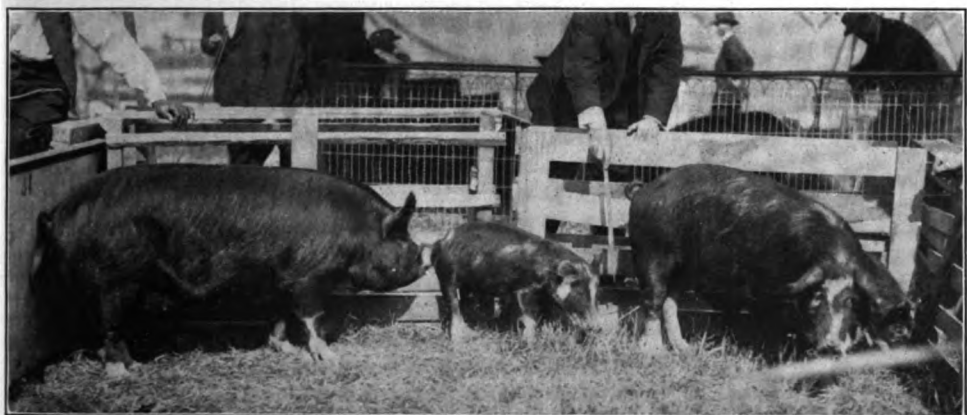
Andalusian, Blue. A compact, graceful



Exercise and good food, each in abundance, are the prime needs of little pigs

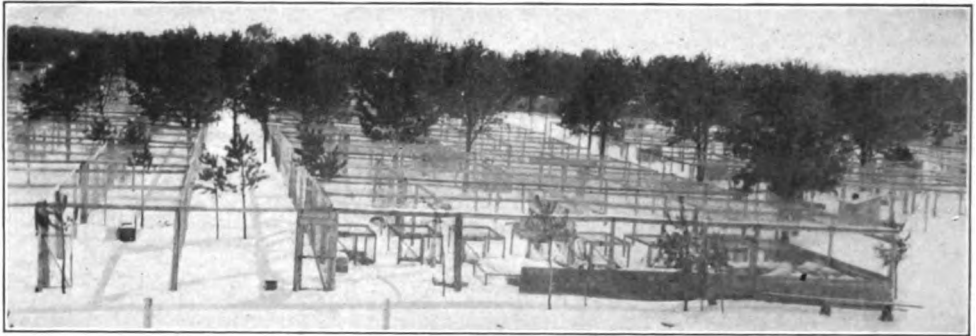


Older pigs can get both by grazing down crops



At left a purebred; at right a grade 3 days younger; in centre a half sister and litter mate of the grade. The first two, fed by a pig club member, weigh 305 and 205 pounds; this shows the effect of pure blood; the third was fed "any old way" by a neighbor and weighs 49 pounds; this shows the effect of careful feeding even on scrub stock. (U. S. Bureau Animal Industry)

SWINE—ONE OF THE CORNERSTONES OF PROFITABLE FARMING



A black-fox fur farm in winter



A herd of protected bison on a National preserve



White-tailed deer, half domesticated in a park

LIVESTOCK STILL WILD, BUT WHICH MAY YET BE DOMESTICATED

bird of good carriage, resembling the Mediterranean breeds in general appearance. Has been bred in this country for nearly half a century. The hens are good layers. The distinctive plumage is a slaty blue, each feather having a well defined lacing of darker blue, with slaty blue under color.

Black Spanish, White Faced. The oldest of the Mediterranean breeds, distinguished by a long, loose hanging, white face. An attractive, graceful, active bird; the hens lay well and the eggs are large and pure white. Shanks are dark leaden blue or black. Plumage a lustrous, greenish black with dark slate under color.

Brahma. Developed in America from Oriental parentage; the largest breed of fowl and the best for heavy roasters. Hens are excellent winter layers, but too heavy for ideal mothers. Shanks and toes are very heavily feathered. Varieties: *Light.* Main color white with black and white cape and hackle, and black tail. Weights, cock, 12 pounds; cockerel, 10; hen, 9½; pullet, 8. *Dark.* Showing a beautiful combination of lustrous, greenish black and white with slate under color. Weights, cock, 11 pounds; cockerel, 9; hen, 8½; pullet, 7.

Buckeye. Originated in, and named after, the state of Ohio. Solidly built, blocky birds of a handsome, mahogany bay color. Good market birds and the hens are excellent layers and mothers.

Buttercup or Sicilian Buttercup. About same weight as the Leghorn; prevailing color reddish in male, buff in female; distinguished by a cup-shaped comb with points. Said to be hardy; quick growers, and very tame. Remarkable egg records have been claimed for the hens.

Campine. A hardy breed originated in Belgium, and becoming more popular in this country as an egg producer. Extreme hardiness, heavy laying habits, superior broiler quality and smaller feed consumption than other breeds of equal weight are claimed for it. Well-bred, the birds are handsome and active, but also become very tame. Varieties: *Silver.* Prevailing color is greenish black, each feather distinctly barred with white; slate under color. *Golden.* Prevailing color greenish black distinctly barred with golden bay. Both varieties are supposed to lay white eggs, but some of those from the Golden are tinted. Best breeders are breeding away from this.

Cochin. Deep bodied, of rounded outline and massive appearance; the plumage is so abundant and fluffy that the birds appear heavier than they really are. Shanks and toes are heavily feathered. Weights same as Dark Brahma (above). Varieties: *Buff.* An even shade of rich golden buff with lighter under color. *Partridge.* Plumage a beautiful combination of lustrous greenish black, mahogany brown and reddish bay with slate

under color. *White. Black.* Of a lustrous greenish black with dull under color.

Cornish. A breed developed and perfected in England and formerly, but incorrectly, called the Indian Game. The birds are very strongly built, with deep, wide bodies, broad breasts, legs set wide apart, and an appearance of great strength and vigor. They have yellow legs and pea combs, and are very close and hard feathered, being much heavier than they appear. They fatten easily, too much so for best results in egg production, but are exceptionally good as meat producers. Varieties: *Dark.* Prevailing colors in the male, lustrous greenish black, dark red and bay; in the female, bay approaching mahogany, lustrous black; dark slate under color. *White. White Laced Red.* Prevailing colors bright rich red and silvery white; white under color.

Crevecœur. An old French breed, useful, and handsome, but has not become very pop-

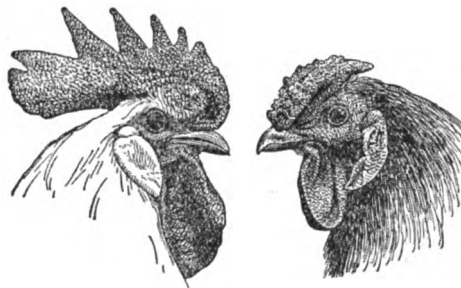


FIG. 247. Single and rose combs, the two important forms

ular in America. Peculiar in having both a crest and a beard. Color of the one variety mostly black.

Dominique. Much like the Barred Plymouth Rock (p. 211) but a little lighter in weight and has a rose comb. The birds are very active; the chicks are slow growing; the hens are persistent sitters and good mothers.

Dorking. One of the oldest breeds of domestic fowl and one of the best for table use. Rectangular in shape, broad, deep-bodied, short-legged, 5-toed and very compact. The hens are good layers for a heavy breed (especially in winter), good sitters and mothers. Varieties (which differ in weight, the Colored being the heaviest and the White the lightest): *Silver Gray.* Plumage a combination of silvery white, greenish black, lustrous black and gray, with slate under color. *Colored.* A combination of black, white, light straw color and greenish, lustrous black with dark slate under color. *White.*

Faverolle. One of the best of the French breeds for practical purposes. The body is deep, the back square, the breast full—an ideal shape for meat production. The birds have heavy beards, 5 toes and feathered legs. Varieties (only the Salmon is in the American

Standard): *Salmon*. Prevailing colors, of male, reddish brown, light brown, black, greenish black, and straw; of female, salmon-brown and cream; both with slate under color. *English Salmon*. *French Salmon*. *English Ermine*. *French Black and Blue*. *White*.



FIG. 248. A Crevecoeur rooster

Hamburg. A handsome old breed originated in the Netherlands with no standard weights, but about Leghorn size. The hens are good layers of large white eggs. Varieties (all with leaden blue shanks and toes except the *Black*): *Golden Spangled*. Golden bay and greenish black forming a beautiful combination; under color slate. *Silver Spangled*. Prevailing colors silvery white and black; under color slate. *Golden Penciled*. Prevailing colors lustrous reddish bay, black and greenish black; under color slate. *Silver Penciled*. Prevailing colors, white, greenish black and slaty white; under color slate. *Black*. Plumage lustrous greenish black; dull black under color; black shanks and toes. *White*.

Houdan. One of the oldest French breeds, all of which exhibit superior table qualities. Much like the Dorking in shape and size; has 5 toes; the hens are excellent layers. Besides being useful the birds are strikingly handsome being distinguished by small V-shaped combs and large round crests. Varieties: *Mottled*. The prevailing color being black with about 1 feather in 5 tipped with white, except in the fluff where they are tipped with gray; dull black under color. *White*.

Java. An old, long-bodied American breed, of large-medium size and fine appearance. Varieties: *Black*. Glossy with greenish sheen. *Mottled*. Mostly black but some white, the colors sharply divided

La Fleche. Somewhat heavier than the other French breeds. Long bodied, strongly built, a very popular meat breed in France, especially for capons. Has neither crest nor beard, but a V-shaped comb. Color is solid black; shanks leaden.

Lakenvelder. Resembles the Leghorn in form, size, activity, and egg-laying qualities. Color is white, with black head, hackles, rump, and tail.

Langshan. Lighter in weight, more upright and more active than the other two Asiatic breeds (*Brahma* and *Cochin*); shanks less heavily feathered and feathers on outer toe only; very deep bodied. Varieties: *Black*. Of lustrous, greenish black with solid black under color. *White*.

Leghorn. Undoubtedly the leading egg breed; found on practically all the large egg farms. The Connecticut Experiment Station (Storrs) reports that Leghorns have made up 38.4 per cent of all the birds entered in its last three annual egg laying contests. They are small, alert, vigorous, non-sitting, with yellowish legs and skin. Varieties: *S. C.* (single comb) *White*. The variety most often found on commercial egg farms. *R. C.* (rose comb) *White*. Similar except for a neat rose comb. *S. C.* and *R. C. Brown*. Handsome, graceful birds in which brilliant red, lustrous greenish black, light and dark browns and rich salmon predominate. *S. C.* and *R. C. Buff*. Of an even rich golden buff with lighter under color. *Black*. Of a lustrous greenish tone with dull black under color. *Silver*. Plumage mostly silvery white and black with gray under color. *Red Pyle*. Plumage a combination of white, red, bay, and orange or yellow, with white under color.

Minorca. The largest of the Mediterranean breeds. Long, compact, trim bodies; very large combs and ear lobes, and long wattles; dark legs and flesh colored skin. Varieties: *S. C. Black*. The most common and the heaviest variety, standard weights being cock, 9 pounds; cockerel and hen, 7½; pullet, 6½. The hens are non-sitters and lay very large white eggs. Plumage a lustrous, greenish black free from purple and with dull black under color. *R. C. Black*. Similar except for the rose comb and lighter weight. The Standard weights of all but the *S. C. Black* are cock, 8 pounds; cockerel and hen 6½; pullet, 5½. *White*. Plumage pure white. *S. C. Buff*. An even



FIG. 249. A White Japanese Bantam, one of the ornamental breeds.

shade of rich, golden buff with lighter under color.

Orpington. A fairly new English breed developed especially for utility purposes. Of large size and stately carriage; long and full bodied; excellent for the table; hens are good layers and mothers. Varieties: *Buff*. Of an even, rich, golden shade with lighter under color. *Black*. Of a lustrous, greenish tone with dull under color. *Blue*. Plumage a combination of dark slaty blue and very dark lustrous blue with slaty under color. *White*. Each of these has both a single and rose comb form. There are also the uncommon *S. C. Jubilee* and *Ermine* varieties.

Plymouth Rock. One of the best general-purpose breeds, hardy, of medium size, and fine carriage; hens are good winter layers, sitters, and mothers. Varieties: *Barred*. Plumage grayish white, each feather crossed by narrow darker bars. A popular variety, but hard to breed true to Standard. *White*. Easier to breed true, therefore best for beginners. *Silver Penciled*. Beautiful, silvery white and black plumage. Claimed to possess all the practical qualities. *Buff*. An even, rich, golden buff. *Columbian*. Plumage like the Light Brahma (p. 209). *Partridge*. Marked like Partridge Cochins (p. 209).

Redcap. An old English breed said to be very useful; distinguished, as the name suggests, by a very large rose comb. The body is deep and well rounded. Plumage, of male, red and black; of female, brown and black.

Rhode Island Red. About the same weight as the Wyandotte but less blocky; more oblong in shape; a good all-around, handsome breed. Hens are excellent winter layers and good mothers. Varieties: *Rose Comb* and *Single Comb*. Alike except that some have claimed the Singles to be the better layers.

Rhode Island White. Originated by a Rhode Island Red breeder who wanted "something better" than the Red. Not yet in the Standard of Perfection, but promoted by a strong club. Good all 'round business birds.

Sussex. Originated in Sussex County in England and rather new to this country. The body is long, broad at the shoulders and deep; legs, skin, and flesh are white. Varieties: *Speckled*. Main color a lustrous, reddish brown, with black and white in stripes and tips; under color slate shading into white. *Red*. Plumage, mainly rich mahogany red with black; under color slate shading into red.



FIG. 250. Red Pyle Game Bantam, another ornamental sort.

Wyandotte. A very compact breed with a characteristic form made up almost entirely of curves. One of the best general-purpose breeds, unexcelled for broilers or small roasters; the hens are fine winter layers, sitters, and mothers. Varieties: *Silver*. *Black*



FIG. 251. The remarkable Silky breed

and white giving a scale-like effect (the original variety). *White*. One of the easiest to breed; best for the beginner. *Buff*. An even shade of rich golden buff, with lighter under color. Claimed to be one of the best laying varieties. *Partridge*. Plumage like the Partridge Cochins (p. 209). *Black*. Beak, shanks, and toes are black shading into yellow. *Columbian*. Plumage like the Light Brahma (p. 209). Hard to breed true, but an excellent business variety. *Silver Penciled*. A newer handsome variety, but like other parti-colored varieties, harder to breed true. *Silver* and *Golden*. Two less common, handsome varieties, also hard to breed true.

Ornamental Breeds and Varieties

(SEE AMERICAN STANDARD OF PERFECTION FOR FULL DESCRIPTIONS)

Polish. Has huge chrysanthemum-like crest. Varieties: *White Crested Black*, *Bearded and Non-bearded Golden*, *Bearded and Non-bearded Silver*, *Bearded and Non-bearded White*, *Buff Laced*.

Game. Tall, upright birds of medium size. Combs of cocks always trimmed (dubbed). Varieties: *Black Breasted Red*, *Brown Red*, *Golden* and *Silver Duckwing*, *Birchen*, *Red Pyle*, *White*, *Black*.

Game Bantam. Small edition of all above varieties. Combs of cocks never trimmed.



FIG. 252. Buff Cochin Bantams are attractive pets and the hens are excellent mothers.

Sumatra. One variety. *Black*.

Malay. One variety. *Black Breasted Red*.

Malay Bantam. Small edition of *Malay*.

Ornamental Bantam. Chiefly ornamental but in some cases good layers and excellent mothers. Really a family or group including these 7 breeds: *Sebright*, *Silver* and

Golden varieties; *Rose comb*, *Black* and *White*; *Booted*, *White*; *Brahma*, *Light* and *Dark*; *Cochin*; *Buff*, *Partridge*, *White*, *Black*; *Japanese*, *Black-Tailed*, *White*, *Black*; *Polish*, *Bearded White*, *Buff Laced*, *Non-bearded*.

*Silkie*s, *Sultans*, and *Frizzles* are rare, freak

forms distinguished by peculiar types or arrangements of plumage.



FIG. 253. White Crested Black Polish hen

UTILITY BREEDS OF FOWL IN AMERICA

(A star [*] indicates a breed with feathers on shanks. The authority for the weights is the American Standard of Perfection.)

NAME	ORIGIN	PURPOSE	NO. OF VAR.	COLOR OF SKIN	COLOR OF EGG	TYPE OF COMB	SIZE AT MATURITY (POUNDS) COCK—HEN
Ancona	Italian	Layers	2	Yellow	White	Single and Rose	5½—4½
Andalusian, Blue	Spanish		1	Grayish White	"	Single	6—5
Black Spanish	"		1	Gray	"	"	8—6½
White Faced	"		1	Gray	"	"	9—6½
Brahma*	Asiatic	Meat	2	Yellow	Brown	Pea	{ Light 12—9½ Dark 11—8½
Buckeye	American	General	1	"	"	"	9—6½
Buttercup	Italian	Layers	1	"	White	Cup-shaped	6—4
Campine	Belgian		2	"	"	Single	6—4
Cochin*	Asiatic	Meat	4	Yellow	Brown	Pea	11—8½
Cornish	English		3	"	"	"	10—7½
Crevecoeur	French	General	1	White	White	V-shaped	8—7
Dominique	American		1	Yellow	Brown	Rose	7—5
Dorking	English	"	3	White	White	Single and Rose	{ White 9½—6 Silver Gray 8—6½ Colored 9—7
Faverolle*	French	"	6	"	Tinted	Single	8—6½
Hamburg	Netherlands	Layers	6	Gray	White	Rose	(No standard)
Houdan	French	General	2	White	"	V-shaped	7½—6½
Java	American	"	2	Yellow	Brown	Single	9½—7½
La Fleche	French	"	1	White	White	V-shaped	8½—7½
Lakenvelder	German	Layers	1	"	"	"	(No standard)
Langshan*	Asiatic	Meat	2	"	Brown	Single	9½—7½
Leghorn	Italian	Layers	9	Yellow	White	Single and Rose	5½—4
Minorca	Italian		5	Flesh-colored	"	"	9—7½
Orpington	English	General	10	White	Brown	Single	10—8
Plymouth Rock	American		6	Yellow	"	"	9½—7½
Red Cap	English	"	1	{ Gray or Grayish White }	"	Rose	7½—6
R. I. Red	American	"	2	Yellow	Brown	Single and Rose	8½—6½
R. I. White	"	"	1	White	"	"	8½—6½
Sussex	English	"	2	White	"	Single	9—7
Wyandotte	American	"	9	Yellow	"	Rose	8½—6½

By REESE V. HICKS, formerly president of the American Poultry Association and now Editor of the Poultry Item and manager of one of the largest poultry farms in the East—a farm that produces both fancy and utility stock. His opportunities for gaining a knowledge of both principles and practice in the poultry field have been exceptional and practically nation wide. His extensive editorial experience enables him to discuss a difficult but important subject in a clear, convincing way.—EDITOR.

IDEALS and standards. In order to develop and improve poultry, breeders had to have ideals or standards to guide them. So poultry raisers in a convention adopted, and later published in book form, a collection of standards for the different breeds that is called the Standard of Perfection. These standards are necessarily set a little higher than the average living specimen could be expected to reach; but they supply a goal toward which any breeder can work.

A detailed line drawing of a rooster, facing right. The rooster has a large, prominent comb and wattle. Its body is covered in feathers, with some areas labeled. The labels are as follows:

- BEAK
- EYE
- EAR
- WING
- NECK
- COMB
- FEATHERS
- BACK
- RUMP
- TAIL
- LEGS
- FEET
- CLAW

Fowl bred to a definite standard are more uniform in size, appearance, rate of growth, quality, and production. They are therefore more valuable, more attractive when viewed in houses, yards, etc., and a source of more profit and greater pleasure than fowl of mixed or unsystematized breeding can ever be.

determines the vitality of the bird, indicates its egg-laying possibilities and shows the amount of meat it will yield; it is therefore by far the most important point to consider. *Size* follows closely. A fowl much under the Standard size should never be used as a breeder. In selecting males choose masculine, rugged ones with strong head features not snaky, weakly ones. The breast should be full, the back broad, the beak strong and well curved, the feet strong, the eyes bright, clear and of good size, and the carriage alert, not drooping. The action should be alert, prompt and never sluggish. All these char-

Shape (or *type*) makes the breed, largely

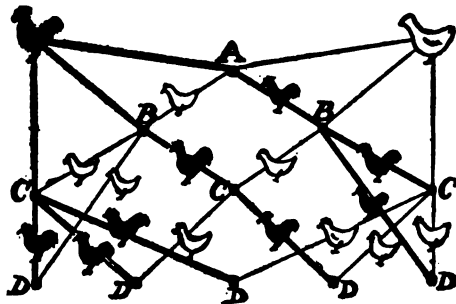


FIG. 255. Diagram to illustrate line breeding. Black birds and double lines represent the male line; white birds and single lines the female side. *a* is the first mating; *b* the second; *c* the third, and *d* the fourth.

acteristics denote good vitality and health in any breed whatever its shape. Females should be neater and trimmer about the head but otherwise show all the same signs of vitality.

Combined selection and breeding is the best and most rapid method of improving fowl. It means simply selecting the most desirable males and females and mating them in such a manner as will give the best results. In practice the problem is not so simple for it requires a knowledge of just what is wanted as well as what there is at hand and what the effects of combining certain features will be. There are four kinds of breeding or mating as follows:

1. **Inbreeding.** This is the closest possible mating as, for instance, of full brother and sister. It is seldom, if ever advisable, except for the expert. If continued to any extent, or if extra care is not taken to offset its possible evil results, inbreeding will weaken the stamina of a flock and soon cause it to "run out."

2. **Line breeding.** This, as its name suggests, means breeding in a line from a male and female selected for certain desired qualities. The second step in this system consists of breeding this same male to one of his daughters, and a son of the first mating back on his dam—the original female. These second generation specimens must also be carefully selected for their desirable qualities. In the third mating a male and a female from the re-

sults of these second matings are bred together. In the fourth mating, a male from the third mating is bred back to the original female and a female from the third mating is bred back to the original male. This puts seven-eighths of the original blood in each line and the crossing back and forth may be continued indefinitely. This method requires extra good specimens to start with, but enables the breeder to carry along their good points without too close inbreeding and the dangers thereof. At the same time it is difficult to follow up beyond 3 or 4 years unless the breeder is thoroughly experienced.

3. **Crossbreeding** is the mating together of males and females of different varieties or breeds. It is commonly believed that this increases the vigor, health, and productiveness of the offspring, but except as it prevents the weakening effects of inbreeding this is not true. More often the poor qualities of the parents are brought out and intensified in the offspring while the good ones are lost sight of. In any case the offspring are a mixed lot as to colors, and often are not uniform as to type. Their market value is lowered and as breeders they are neither one thing nor the other. There are plenty of good breeds and varieties. It is a waste of time and money to cross them in the hope of producing something better.

4. **Outbreeding or outcrossing.** This consists of bringing in a male or female of the same breed and variety but not related to the existing stock. It is done where inbreeding or careless breeding methods in general have caused some unfavorable quality to appear; also to strengthen the breeding birds. The new birds are selected especially for those qualities that are being lost by the original stock. Where careful methods are followed, the offspring from an outcross is usually kept and watched for a year to see how it develops and whether it is fitted to remedy the existing defect, before it is used extensively.

One form of this system is used by many breeders who do not wish to bother with separate pens and matings. A new lot of males is purchased each year and killed off as soon as the breeding season is over. If well bred males are secured, this is an easy way to improve a flock.

Breeding for Color

Since the plumage color is a mark or badge of the variety and largely indicates the purity of the fowl's breeding, it is an important item in breeding practices. There are 3 basic colors that singly or in combination make up the plumage color of fowls. These are red, black, and white. On the basis of color fowls are divided into 2 groups. One includes the *solid colored* type such as blacks, whites, and buffs; the other is the *parti-colored* type including the barred, laced, penciled, and other broken colored sorts. In reproducing these colors, 2 methods of breeding and a combination of them are used. These are single mating, double mating, and intermediate mating.

Single mating. This is the mating of males and females of as nearly as possible the exact Standard requirements as to plumage color. If the birds are well colored and prepotent, that is, have the ability to reproduce their color, the offspring, both male and female, should come close to the required color standard. This is the natural and easy system and is largely used in breeding practically all the solid colored varieties.

Double mating. This calls for one mating of specially selected birds to produce males of the right color, and another, of other birds, to produce females of the Standard color. It was first used in breeding Barred Plymouth Rocks and is still used in connection with this and other parti-colored varieties. To illustrate the system, suppose that a male Barred Rock is wanted. Then a male of the Standard color—or near it—is mated with a female well barred but much darker than the Standard calls for. This is called a *cockerel mating*

because only the male offspring will be of the right color; the pullets (called “cockerel-breeding females”) will be too dark. However if both parents had been of nearly Standard color the cockerels would have been too light.

Similarly, to produce females of Standard color, a male, well barred but much too light to meet the Standard requirements, is mated with a female of the right color. Such a *pullet mating* produces females of the right color but males that are too light and that are called “pullet-breeding males.”

Intermediate mating. This is a combination of the systems just described, sometimes used by those who do not care to take the trouble to really double mate. It makes use of a male medium in color, that is, between the Standard male color and the best color for breeding females; and a female midway between the dark and the Standard colors. The method is less successful than either of the others.

Modern Practices for Poultry Improvement

Trapnesting. A trapnest is a nest enclosed on 3 sides with a hinged door in front that closes when a hen enters to lay and keeps her there until released by an attendant. With such a nest an exact record can be kept of the number of eggs laid by each or any hen in a given time. Each hen being thus trapnested

season, but it is possible for almost any one to trapnest and keep a record for a few months, say November, December, and January. By selecting for breeding the hens that show the best records, the egg laying qualities of the flock—especially for winter production—can be definitely improved.

Egg-laying contests. In order to encourage breeding and selection for egg production, various state experiment stations and some private concerns have staged contests, for a year, in egg production. Usually each competitor enters 5 or 10 hens. Records of such contests show wide variation, from no eggs at all up to 314 per hen per year. Anything over 200 is considered a good record.

Poultry exhibitions. These are held in connection with agricultural fairs and also independently. They bring together the best specimens, and encourage poultry raisers to carefully select and breed to a definite standard, and thus build up their flocks from year to year. Also they help to educate the public to an appreciation of the beauty as well as the usefulness of well bred, carefully selected

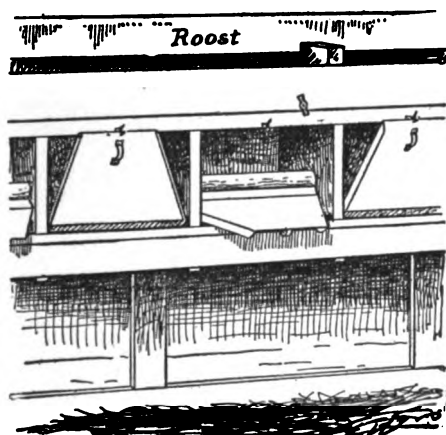


FIG. 256. Part of a row of trapnests built-in under the roosts

carries a numbered metal or celluloid ring on her leg; whenever she is found in a nest her number is credited with an egg on the record sheet.

This requires considerable time and care and is practised on a large scale only by expert breeders, experiment station workers and others who are studying or aiming to develop egg producing ability. It is too costly for the small breeder to keep up for an entire

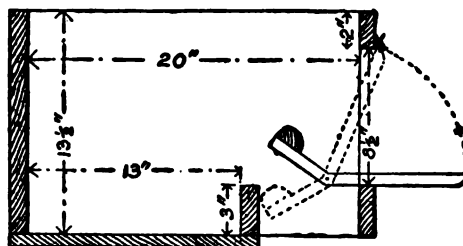


FIG. 257. Side view of trapnest showing dimensions, hinged door weighted at the bottom, and catch to hold it shut when a hen has entered. (N. Y. [Cornell] Bulletin 284).

birds. Of course their efficiency depends upon the sincerity, honesty, and soundness with which they are conducted.

The pelvic bone test for layers. It is possible to identify a hen that is laying by examining with the fingers



FIG. 258. Diagram of pelvis of hen showing (a) where to measure the spread of the bones and judge of her laying qualities.

the spread between the pelvic bones just under the rump. In the smaller breeds, a spread of 2 to 2½ inches indicates a hen in full laying, unless she is extra fat, in which case the fat may spread the bones apart. In larger breeds the space is greater. If the spread is only an inch or so, the hen is either just getting into condition to lay or is just "laid out" and quitting. If

the bones are practically together she is some time away from a laying period.

By catching and examining the hens once a month, the breeder can find out which are

likely to lay in the next few weeks or which are then laying. In this way the "drones" can from time to time be weeded out. The best time to do this weeding is in early winter and again just after the heavy laying season, say in June or July.

What to consider in selecting layers. A hen that is, or is going to be, a heavy layer is usually wedge shaped; but not always. She should have a deep body, wide between the legs, rather broad in the back, wide in the rear and somewhat sloping from front to rear on the sides. She should be alert and active, getting up early, staying out late, constantly searching for food and usually "singing" more than her companions. Her face, comb, wattles, etc., are bright in color and her eyes are bright and clear. She is neither very fat nor very lean, but strong and robust, except that, after heavy laying, she may appear worn with faded plumage. At the beginning of her laying her coat looks extra nice and smooth. The color of her skin, legs, and feet may also become paler than the Standard calls for in her breed after a heavy laying period but this change is not always a dependable sign.

III. THE POULTRY INDUSTRY

Importance. No other farm animal is so widely kept or found on as many farms and homesteads, both in villages and towns, as the domestic fowl. No other single product of farm, mine, or factory equals in value the total poultry products of the country. The accompanying figures and diagram based on the last census returns are striking but not complete for the census takes note only of "poultry on farms." This leaves out entirely the vast numbers kept in towns and villages where some of the best breeders and most extensive breeding establishments are located. As many of the latter specialize in birds or eggs for breeding purposes, which sell for much higher prices than market stock, a grand total including their values would be far greater than any figures heretofore published.

From the market standpoint both domestic and export figures are interesting. The average annual egg receipts at the seven leading markets of the country by 5-year periods have been:

1891-1895	5,818,244	cases (30 dozen each)	1906-1910	12,360,259	cases (30 dozen each)
1896-1900	7,295,645	" " " "	1911-1916	15,820,207	" " " "
1901-1905	9,067,741	" " " "			

Notwithstanding this increased production, prices also increased considerably in the same periods.

The export figures for 1916 were: 26,396,203 dozens of eggs, valued at \$6,134,441 and poultry and game (meat) valued at \$1,561,398.

Development. In common with other lines of farming, poultry keeping has developed greatly in recent years, both in numbers and in the care given the fowls and the results obtained. Under the old, more or less haphazard system of hatching and brooding only with hens, a large business was practically impossible. To-day incubators handle up to many thousands of eggs at one time, and hundreds of chicks are safely brooded at less expense per head and with more certain, more uniform results.

LEADING STATES FARM POULTRY PRODUCTION. (1910 Census)

STATE	NUMBER OF POULTRY ON FARMS	STATE	RECEIPTS FROM EGGS AND POULTRY
Iowa	23,482,880	Ohio	\$18,362,951
Illinois	21,409,835	Missouri	18,285,980
Missouri	20,897,208	Illinois	18,080,352
Ohio	17,342,289	Iowa	17,594,432
Kansas	15,736,038	Pennsylvania	16,192,756
Indiana	13,789,109	New York	15,161,114
Texas	13,669,645	Indiana	14,536,464
Pennsylvania	12,728,341	Kansas	11,623,882
Minnesota	10,697,075	Michigan	10,293,428
New York	10,678,836	California	8,736,282
United States	295,880,190	United States	\$256,041,773

Formerly poultry were kept—or rather allowed to keep themselves—purely as a side line. If they supplied some eggs and an occasional carcass well and good; if not the loss was little or nothing. To-day large farms are devoted entirely to poultry either fowl, turkeys, ducks, or geese. Many of them specialize along such lines as the production of high class market eggs, exhibition birds, day old chicks, broilers or roasters, pullets for layers, breeding stock or eggs for hatching. The very definite demands of certain large markets are an important factor in distributing the special types of poultry raising throughout the country.

Thus near most large cities are market egg farms turning out either all white or all brown eggs (see Vol. IV, Marketing). Some cities such as Boston, pay high prices for large roasters and capons, consequently a special industry has grown up around southern Massachusetts and in other sections. Specialized duck farms are found on the shores of Long Island and elsewhere, many of them carrying scores of thousands of waterfowl. Throughout the Middle West fattening plants have grown up. These send out wagons over regular routes at regular intervals, buy up surplus birds from the farmers, collect them at one point and fit them for market to which they are shipped in wholesale lots.

Breeders of exhibition and breeding stock are of course more independent of markets, provided they keep their names and the quality of their products before the buying public. At the same time nearness to a selling point and good shipping facilities are as valuable to the poultryman as to any other type of farmer.

Aids to the poultryman. The United States Department of Agriculture and the state agricultural colleges and experiment stations are carrying on extensive experiments and issuing many valuable publications with which the poultryman can enlarge his knowledge, improve his methods and increase his success. Poultry clubs for boys and girls are helping greatly in this work; more than 10,000 were said to be in successful operation early in 1917. Finally there are excellent books on all phases of the subject with which any one can keep well up to date.



CHAPTER 21



Turkeys and Turkey Raising

By T. F. MCGREW, Principal of the Poultry Department of the International Correspondence Schools and also a practical farmer whose activities, though general, have always included poultry raising as an important feature. He is author of a Farmers' Bulletin on Turkeys and several books on poultry raising in general.—EDITOR.

THE modern turkey and its origin. All varieties of domestic turkeys have descended from the wild species found in Central America by the early explorers, who, returning to Spain, took some of the fowls with them. From Spain the turkeys were distributed through Europe, more attention being given to their domestication and the development of varieties in England than anywhere else. Thus the Black, White, and Cambridge varieties were developed there, and later brought back to America by the early New England settlers.

The Bronze variety then sprang from the crossing of the Black turkeys brought from England with the wild turkeys of North America. The naturalist, Audubon, records the fact that wild turkey toms visited barnyards and mated with the domestic turkey hens, thus adding vigor to the domestic flock. All other varieties of turkeys have sprung from the crossing of these four, namely, the Black, White, Cambridge, and Bronze.

Where turkeys can be raised. Turkeys do well in all parts of the world. In their wild state they ranged from Central America into Canada and now they

are raised almost from the frigid to the torrid zone. Large numbers are raised in Missouri, Texas, and California, but the birds do equally well in the Middle and New England States. Turkeys, as we now know them, quickly become acclimated in any locality and will thrive if properly cared for. One of the chief essentials in their care is that the young turkeys be kept separate from other fowls although old ones will do fairly well in company with other fowls.

What turkey raising offers and demands. Turkeys are usually sold at from 18 to 30 cents per pound live weight. In order to produce the best, only healthy and vigorous breeding stock can be used, and both old and young must have the right care. One of the chief causes of the decline in health and vitality of turkeys in general has been the practice of inbreeding. In some localities where large numbers of turkeys were raised, no new blood had been introduced into

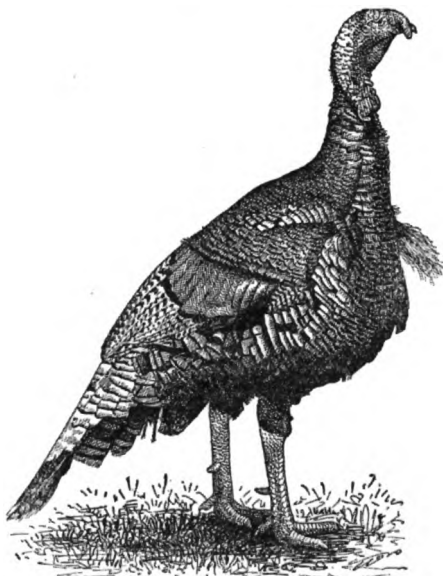


FIG. 259. The Bronze is easily the most popular variety of turkey in America

the flocks for more than 20 years; the result was naturally deterioration. This condition has been corrected to a considerable extent in late years by the introduction of wild and half wild toms into domestic flocks, and at the present time stock that will produce livable poults is more plentiful than ever before. If care is given to the selection of breeding stock of this kind, much less trouble will be experienced in raising turkeys than in the past.

How to Begin With Turkeys

The best way to begin is to buy 3 or more hens, according to the size of the flock desired, and a tom, which will answer for 6 hens. Each hen should produce 15 turkeys each year, as many as 30 having been produced in a year by a single hen. Turkeys from which good stock can be bred will cost from \$25 to \$35 apiece. Those that can be bought for less (\$3 to \$5 each) are usually of ordinary market quality.

A beginning may also be made by purchasing turkey eggs from persons who make a specialty of eggs for hatching. Such eggs range in price from 25 cents to as much as \$2 each. The price is relatively unimportant if it is desired to establish a foundation flock and if the eggs come from healthy, vigorous stock. Nine eggs costing say, a dollar apiece can be placed under a hen of large size with a chance of 7 or even the whole 9 hatching; even if only a trio, 2 hens and a tom, are produced, their cost will be less than if grown birds were bought.

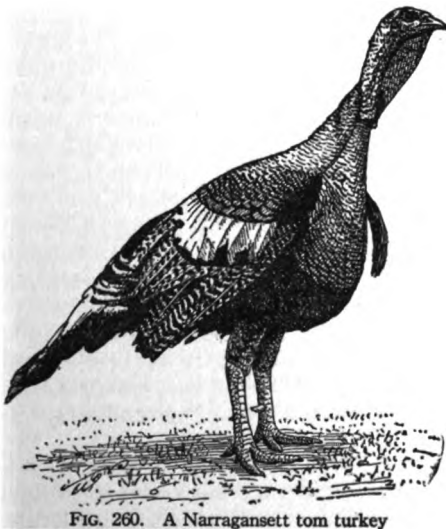


FIG. 260. A Narragansett tom turkey



FIG. 261. A Bourbon Red turkey gobble strutting

Varieties. The most popular variety in America and therefore the one most generally bred is the Bronze; the others are valued in this order: Black, White, Bourbon Red, Narragansett, Buff, and Slate. Each is good in some particular. Bronze turkeys are preferred because they are rugged and will grow to the largest size between the time they are hatched and Thanksgiving. Bourbon Red turkeys are preferred by many because they are very vigorous. Narragansetts, when of good quality, are fully the equals of the Bourbon Reds, but there are so few of them that they can seldom be obtained. Both the Black and the White varieties are good, but neither is plentiful.

Breeding stock. It has been claimed that the first essential of profitable turkey growing is good stock, by which is meant not necessarily fancy stock, but stock from fowls of good size and proportions that have been carefully mated and bred to produce hardy, vigorous poults free from disease and that will attain good marketable size by Thanksgiving time, which is, of course, when turkey raisers expect to reap the harvest for their season's work.

For breeding purposes select a turkey hen weighing about 16 pounds, with broad back, full breast, and short legs; she should be at least 2 years old and may be several years older. Some of the best turkey poults ever raised were produced on the Lord Farm near Westerly, Rhode Island, from turkey hens past 5 years of age. Eggs from hens that have been laying for several years are the right kind for hatching.

Choose a tom turkey not less than 2 years old, in perfect health and vigor, full grown, and of medium weight for the breed; cut his toe nails and spurs before mating him

with the hens. If a 2-year-old tom is not available, a well-matured and vigorous yearling may be used, but in this case it is better to reduce the number of hens.

Feeding the breeding stock. Do not feed breeding stock heavily during the winter months. Give a mixture of corn, oats, and wheat, but no meat scraps. Boiled oats mixed with just enough bran to leave them barely

moist is a good feed for turkeys, and they are very fond of it. About the twentieth of March coarse meat scraps may be mixed into either a dry or wet mash of corn, wheat, and oats. About one tablespoonful of meat scraps a day for each turkey is enough. Turkeys, like chickens, must have plenty of grit and oyster shells, as well as plenty of fresh water to drink.

The Management of Turkeys

Range. The place to raise turkeys is on the farm where they can have free range over considerable territory, part of which should be woodland, part high land, and *all* of it dry land, that is land naturally well drained and free from excessive dampness. A gravelly subsoil is always better than a heavy clay. The "small holder," as the English farmer with 20 acres or less is called, may succeed with a few turkeys, but it is useless to attempt to grow many on a restricted area in confined quarters and with other fowls.



FIG. 262. A nest shelter and roost in a birch wood well adapted to turkey raising

An ideal enclosure where turkeys can lay and hatch and rear their young can be made by fencing in an old orchard with wire. In one instance an orchard of 5 acres was thus fenced in and 15 turkeys—12 hens, and 3 toms—were kept there. Two of the males were confined by themselves and one was allowed to run with the flock for 3 days, when he was confined and one of the others substituted; thus each of the three ran with

the flock 3 days and was confined 6 days. On this farm more than 100 turkeys were raised each year and sold as breeders for high prices.

Handling the flock. All male turkeys that are not good enough to be used as breeders should be cleared off the farm by Christmas. One service of the male will fertilize an entire clutch of eggs, and for this reason no tom unfit to be a sire should be allowed to run with the flock after the first of the year. At this time all surplus stock should have been disposed of, those retained being the very best of the flock. It is never good business policy to sell the best and retain the poorest for breeding purposes. Young toms of desirable quality that are to be kept over may be allowed to run with the flock, for the older ones will prevent them from interfering with their rights.

When an early spring follows an open winter, turkey hens are likely to begin to lay in February or March, according to the locality. In Texas and other Southern states they will begin surely by the first of March, while farther north, in Ohio and Indiana, they may not begin until April. Provide nesting places for the hens fairly near the dwelling house where the hens may find quiet and seclusion and protection from sun and rain. These may be made in boxes or barrels, or better still, under brush heaps. If located under the trees in a near-by orchard the turkeys will be content; they should be fed near the nests and thus encouraged to go there to lay.

Usually the best practice is to gather the first few eggs laid by each turkey hen and give them to a chicken hen of large size to hatch. Then when a turkey hen becomes broody she should be permitted to hatch a nest of eggs. A large

chicken hen can cover 9 turkey eggs, and a turkey hen usually about 15. The eggs hatch in from 27 to 29 days. As the season advances, the poults hatched by both chicken and turkey hens will wander off with the turkeys and live peacefully together.

Shelter and feed for young poults.

A good way to shelter a turkey hen and her poults is to provide a box coop with a movable run. Provided the hen is motherly and disposed to stay close to the coop, she may be permitted her freedom for an hour or two each day. If disposed to wander, it is best to keep her confined until the poults are at least a week old; or she should be given liberty only when she can be watched.

Give poults their first feed as soon as they come from the nest. It should consist of bread crumbs mixed with small bits of oatmeal, cracked wheat, and cracked corn about equal parts; fine corn sold in packages as "hominy grits" is good. When they are 3 or 4 days old they may be fed some finely chopped hard-boiled eggs and milk curds mixed with bread crumbs. The best plan is to give the poults a little at a time but often. They should not be overfed, however, or they will soon gorge themselves and injure their digestion; death may result from vertigo caused by overeating and insufficient exercise. As soon as poults are large enough to go with the mother hen on the range they can be fed twice a day on a mixture of wheat, hulled oats, and cracked corn. Coax them home at night by always feeding in the same place, where they will come each evening for food.

When poults are from 6 to 8 weeks old the red caruncles (fleshy warts) that grow on the head and neck of turkeys begin to develop, this condition being known as *shooting the red*. In the males, the head and neck usually turn quite red; in the females, the color is a pinkish gray. This is a rather serious time for little turkeys, because they pass through what is known as the chicken molt, which begins with the feathers dropping from the head and neck to make room for the caruncles. At this time they need a little more animal food, and if there is not a plentiful supply of bugs and worms on the range, a little cooked meat and some hard-boiled eggs mixed with bread and milk should be fed.

Feeding turkeys for market. It does not pay to market turkeys before they are well fattened, and heavy; constant feeding is needed to get them so. Yet the cost of raising a pound of turkey meat under range conditions is but little more than that of raising cattle or hogs, while it sells for a good deal more. As soon as the first frost comes begin to feed turkeys 3 times a day, at regular hours and always at the same place, all they will eat of whole corn and wheat. They will then be content to stay close to the feeding place, will not exercise much and will gain weight very fast.

Some growers who expect to sell their turkeys for a fancy price add to the noon feeding for the last 2 weeks a mixture of ground oats, cornmeal, and wheat middlings moistened with milk. To give extra fine quality there may be mixed with this mash some celery seed, chestnuts, and a little tallow.

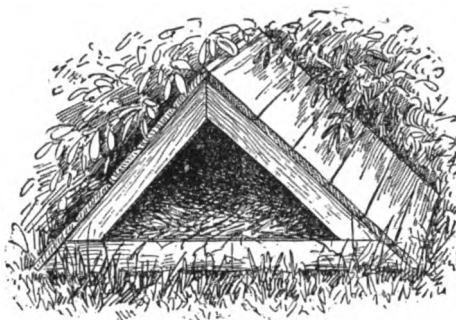


FIG. 263. An easily made nest box for turkeys

Marketing Turkeys

In order to command the best price, turkeys must reach the market in prime condition. If there is a conveniently situated local market they may be killed and

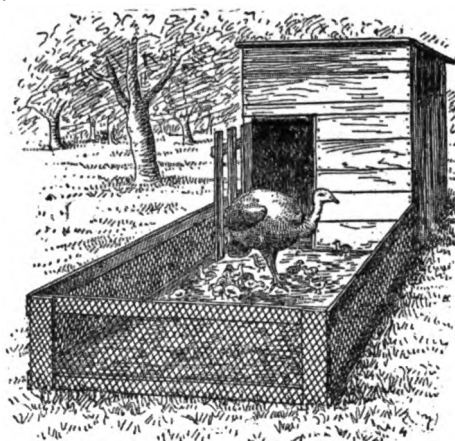


FIG. 264. A simple and efficient brooder house and pen for a turkey hen and her poults

dressed before they are offered for sale. If the market is a distant one, however, the best plan for those who raise only a few turkeys is to sell them alive to buyers who make a business of killing, dressing, and shipping poultry to market.

Killing. The common method of killing all poultry consists of cutting off the head with an axe. But the best method for any kind of fowl is to hang it up by the legs, and stick it in the roof of the mouth with a knife (p. 195). This severs the arteries in the roof of the mouth and cuts into the brain, causing insensibility and a free flow of blood from the mouth.

Dressing. Simply remove the feathers; head, feet, and entrails should not be touched. The birds may be dry-picked—which is best—or scalded so as to

loosen the feathers. In dry picking, commence plucking as soon as the blood begins to flow and before the carcass grows cold; take care not to tear the skin. When a carcass has been neatly picked, hang it head down in a cool place, but *not* where it is cold enough to freeze the flesh.

Packing. Dressed poultry, including turkeys, should be shipped to market packed as closely as possible in tight boxes or barrels, and if the weather is warm or the distance to market great, in ice. Packing the carcasses tightly prevents their shifting about and becoming bruised. If no ice is required, the inside of the package should be lined with clean white or manilla paper, *not* brown, soiled, or printed paper. If ice is used, place a clean board on the bottom of the box or barrel if necessary, cover it with a layer of clean cracked ice, pack in a layer of carcasses, cover with a layer of ice, then more carcasses and so on, the top layer of ice being six or eight inches deep. Fasten the lid of the box or the head of the barrel securely and be sure to put the name and address of the shipper on it.

Enemies and Diseases

Turkeys, especially young ones, must be protected from wild animals, dogs, cats, rats, and hawks, but their first danger and the most serious menace to their growth and development is the presence of lice and mites. Prevent their getting a foothold and half the battle is won. Persian, or any good insect powder dusted into the nest and well into the feathers of the sitting hen will prevent their infesting the poults. Do this twice a week for 2 weeks and once a week thereafter, the last time on the twenty-first or twenty-second day. Never use lime or sulphur.

As soon as the poults are ready to leave the nest, examine them closely, especially the down or folds of the skin on head or neck, under the throat and wings and about the vent for lice, some of which are gray and hard to see. A magnifying glass is a help in looking for them. To kill lice use a *very little* sweet oil on the head, throat, and back of the neck, and insect powder on the body. Look out for the eyes and never use kerosene or coal oil on poults.

Bowel trouble also endangers young poults and may result from exposure to cold and wet, eating sour food, or drinking impure water. To cure it give scalded milk to drink, feed stale bread, cracker crumbs or rice boiled in milk until thoroughly done and almost dry. The latter is especially good for young and old

turkeys. Some successful growers from the beginning feed poults sting nettles, lettuce, and a little onion all chopped fine, claiming that mixed with bread and milk or boiled rice these will not only cure but almost prevent ailments of all kinds. They are good, but they are not cure alls.

Gapes. Turkeys are bothered with, and should be treated for gapes the same as chickens (p. 350). Some use a sewing machine oil can to spray kerosene oil into the wind pipe. This will kill the worms but may kill the poults, and should be done very cautiously if at all.

Diarrhea. Looseness of the bowels, too often mistaken for cholera, may come from any of several causes, such as bad feeding, dampness, filth, or lice infestation. The removal of the cause is the best cure, but feeding boiled rice and a little charcoal will prove of benefit. The remedy most often used is a mixture of equal parts of ground ginger, cinnamon, cloves, and cayenne pepper, mixed into the mash, about a stroked teaspoonful to a dozen very young poults and double the amount after they are 4 or 5 weeks old.

Tapeworm. Tapeworm (as well as other worms) is very injurious to turkeys. Its presence is shown by the indolent, drowsy spirits of infested birds and the discovery of small portions of it in their voidings. Powdered male shield fern is an effective remedy in doses of from 30 grains to 1 dram (powder), or 15 to 30 drops (liquid extract), according to the age of the birds; give it morning and evening before feeding. Oil of turpentine is an excellent remedy for all kinds of worms in the digestive organs, and 1 drop of kerosene oil night and morning is very



FIG. 266. The White Holland is a strikingly handsome but rather uncommon variety

popular and harmless except if given to very young poults.

Cholera. In its true form, which fortunately seldom occurs in the temperate zone, this is the most deadly of turkey diseases. The symptoms are a flow of slime from the bowels, followed by partial paralysis and a stiffening of the muscles and, usually, death. The only way to save a flock attacked by it is to immediately remove and destroy the ailing ones. Transfer the rest to another part of the farm, thoroughly clean and disinfect the place where they were, and feed them only a slight grain diet for a short time. A mixture of sulphur, copperas, and capsicum, equal parts, thoroughly mixed together and given in the mash, a teaspoonful to 8 or 10 poults, is sometimes used, but in general medical treatment is of little help.

Blackhead. This disease, first noticed in New England about 30 years ago, has gradually spread throughout the world. It first attacks the blind gut (cecum) which is between the large and small intestines, then the other internal organs, especially the liver which becomes enlarged and covered with spots. It has always been attributed to microbes that find a home in turkeys that lack vitality.

The most marked and constant symptom is diarrhea which always may be expected sooner or later, resulting from inflammation and internal weakness. A peculiar discoloration of the head occurring when the disease is at its height, has given rise to the popular name. The disease attacks very young turkeys and



FIG. 265. Catching turkeys with a long handled net—easy and safe

often lasts for several months before causing death; it is spread mostly during mid-summer.

Treatment. The use of medicine has not proved very successful. There has been recommended sulphur, 5 to 10 grains combined with 1 grain of sulphate of quinine. Any such treatment must be repeated 2 or 3 times a day and continued for a considerable time if results are to be obtained.

Dr. Hadley, of Rhode Island, after many years of experimenting with blackhead, has come to the conclusion that there are other causes for it besides parasites; that it is not an infectious or communicable disease; that it is due to errors in the management of turkeys, especially in the methods of feeding. To this can be added carelessness in breeding. The main troubles to-day in the raising of live stock of all kinds arise from errors in breeding, feeding, care, and management. Poultry of all kinds are suffering from loss of vitality; eggs for hatching produce so poorly that the beginner is often discouraged by his first attempts.

If the turkeys of to-day were as strong and healthy as those of 40 years ago, the poults would almost raise themselves. They can be made so only by careful selection of the right kind of breeding stock and the practise of correct methods of feeding and management.

How Miss Mahaney Raises Turkeys

Miss Margaret Mahaney, of Concord, Mass., who has attained great success with turkeys

even in confinement explains her methods as follows. (It should be remembered that she has become an expert and gives much time and attention to her flock):

Roomy, comfortable nests 3 feet long, 2 feet wide, and 23 inches high, with the opening toward the wall, are provided, as turkey hens like seclusion. The first eggs are hatched by domestic hens; the last clutch is reserved for the turkey hen. During the laying season the turkey hens are fed plenty of mixed grain (but very little corn) with the addition of 1 pound of air-slaked lime to every 100 pounds of grain.

Portable houses and runs that can be moved every day are provided for the newly hatched poults which are never let out in wet weather or when the dew is on the ground. When their wings have grown they can run all day if the weather is fine. Their first feed is hard-boiled eggs and sting nettle chopped fine. This is followed by the following mixture: 100 pounds of ground wheat and oats the size of small cracked rice, 5 pounds of baby grit, 5 pounds of beef scrap, 5 pounds of charcoal, $\frac{1}{2}$ pound of baking soda, and 1 pound of air-slaked lime. The baking soda provides gas for the crop and intestines. A morning mash for 12 poults may consist of 1 pint of commercial meal and 1 pint of mixed feed, boiled in the broth from a soup bone. Finely cut green feed, such as dandelion, sting nettle, lettuce, or alfalfa is also given, and in addition, all the sour milk they can drink. All poults are examined carefully for parasites, and kept out of the hot sun and wet grass.

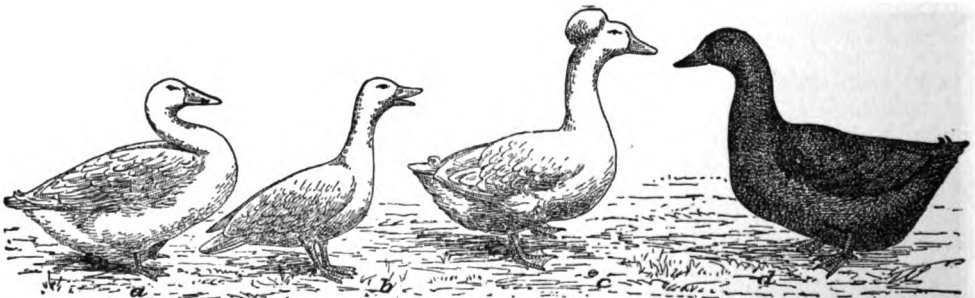


FIG. 267. Some of the less important breeds of ducks: *a* Aylesbury; *b* Call; *c* Crested White; *d* Cayuga (See following Chapter)

CHAPTER 22

Ducks and Geese and How to Raise Them

By ROBERT HERMAN, Superintendent of Laurellon Farms, Lakewood, N. J., a practical poultry expert whose scientific knowledge is backed up by years of successful, practical experience; and F. H. VALENTINE, a poultry raiser and popular writer on poultry subjects.—EDITOR.

DUCKS FOR HOME AND MARKET

EVERY farmer desires—and should have—a variety of home grown food. Because of its ability to profitably turn grass and grain into delicious flesh in a very short time, the duck is an especially desirable fowl for satisfying this want. A 12-weeks-old duckling is all that could be asked for as a delicacy; duck eggs are larger than hens' eggs and of considerable value for table use and baking (especially custards); and the fluffy feathers are used in making pillows, often taking the place of the more expensive goose feathers. And if there is a surplus of any of these above what can be used on the farm, a market for it can almost always be found in the nearest city or village.

As a further advantage ducks are practically free from diseases and will stand considerable hardship, though as with all poultry good care brings best results. *Leg weakness* caused by too heavy feeding is about their only common trouble. Ducklings kept closely confined often get the habit of *feather pulling*, but this can be checked at once by giving them more room. *Red backs* are caused by ducks trampling each other during stampedes which now and then occur at night, ducks being of a nervous temperament and easily frightened. Lanterns hung in their pens and about their yards keep them quiet and as a rule prevent stampedes.

Conditions necessary for duck raising. These are (1) green feed; (2) plenty of water, as in a swampy field fed by live springs or where a running brook or pond is near the buildings; (3) shade, supplied by trees, bushes, a rough board roof or burlap covered frame—anything to protect the ducks from the extreme heat; and (4) some high, dry land—sand or gravel—on which they can sun themselves. Clay soils are undesirable especially along streams or ponds where, becoming slippery, they make it hard for the ducks to get a foothold.

Breeds. Only a few of the following breeds of ducks are suited to the needs of the farmer who wants to raise them either for market or to supply his own table. His choice should be based on the preference of his market and the established practice in his neighborhood.

Aylesbury. The leading market duck of England but is much less esteemed in this country. The ducks are good layers and the young make rapid growth. Plumage is pure white; bill is pink; shanks are orange. Standard weights: drakes 9 pounds; young drakes and ducks 8; young ducks 7.

Black East India. An uncommon Bantam duck resembling the Cayuga, of no particular market value and with no Standard weights.

Plumage is black; bill and shanks black or very dark green.

Blue Swedish. Developed in England this breed resembles the Pekin except for its steel-blue color, solid except for 2 white flight feathers and a heart-shaped white spot on front of breast. Shanks and toes reddish brown or grayish black. Weights 8, 7, 6½, and 5½ pounds.

Call. Really a Bantam duck weighing 4

to 5 pounds to the pair. The ducks are fine mothers and the young grow rapidly, but the breed is used mainly for ornamental and decoy purposes. Varieties: *Gray*, colored like the Rouen (see below). *White*, which has orange shanks.

Cayuga. Large, rapid growing, fairly popular. Ducks are good layers. Standard weights 8, 7, 7, 6 pounds. Plumage, bill, and shanks are all black.

Crested White. A good market and table breed, but seldom seen in the United States

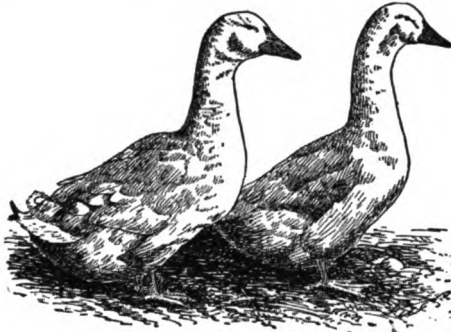


FIG. 268. Pair of Pekin ducks

and then only as an ornamental feature. Weights, 7, 6, 6, 5 pounds. Plumage pure white, including a rounded crest; bill and shanks light orange.

Muscovy. Raised for table use in Germany, here mainly for ornament. Peculiar appearance caused by naked scarlet folds of skin (caruncles) on sides of head and face, and by crest-like feathers on head of drake which has an ugly disposition. The birds fly long distances, roost in trees and have no

cry or note. Ducks are poor layers but good sitters. Varieties: *Colored*, white and black broken with white; shanks yellow to dark red. *White*, with pale orange or yellow shanks.

Pekin. The largest white, and the standard American market breed. Hardy, non-sitting, stands confinement well, matures rapidly weights of 5 to 6 pounds at 9 to 10 weeks being common. Ducks lay on an average 125 eggs a year. The feathers are more valuable than those of other breeds. The Standard weights of 9, 8, 8, 7 pounds are often exceeded, birds of 10 to 12 pounds being common. Plumage solid pure or creamy white; shanks reddish orange.

Rouen. The largest and most popular of colored ducks. Descended from, but much larger than, the Wild Mallard. Of excellent table quality. Weights 9, 8, 8, 7 pounds. Plumage, of drake, a gorgeous combination of lustrous green, black in different tones, gray, shining blue and white; of female, a more sober brown in different shades handsomely pencilled and striped. Shanks orange or orange brown.

Runner. Developed in England and called the "Leghorn of the duck family," because of its small size and heavy laying ability. Records of more than 300 eggs in a year have been claimed, those of over 200 are common. The eggs are large, of excellent quality and should be pure white, although some strains lay greenish eggs. Young birds make fine broilers, often used in place of game. Standard weights, 4½, 4, 4, 3½ pounds. Varieties: *Fawn and white*, in which these colors are sharply defined; shanks orange red. *White*, with orange shanks. *Penciled* with fawn and white plumage, the fawn feathers being finely stippled with a darker shade; shanks orange red.

Duck Raising on the Farm

Hatching. Duck eggs are hatched in 28 days either naturally or in incubators. The Muscovies require several days longer. Ducks will hatch their own, but it is better to use a hen of the Barred Plymouth Rock or other heavy breed of fowl, which will usually make a better mother and raise more ducklings. Give the same care as in hatching hens' eggs (p. 191).

Any standard incubator can be used but the eggs must be given more moisture than required for hens' eggs. After the first week sprinkle them with warm water at noon each day, using a whisk broom. This will of course cause a slight drop in temperature, which, however, should quickly be corrected by the automatic heat regulator. Candle the eggs on the seventh day; clear ones can be used for baking, and spotted ones, that are not hatching, can be fed to hogs.

Keep the thermometer on top of the eggs,

running the temperature at 102 degrees F. from the first to the twenty-fifth day, and at 104° to 105° for the last 3 days. From the fourth day until they commence to pip cool the eggs each morning and night by setting the trays on top of the incubator (keep the door to the egg chamber closed). Let the temperature of the room or cellar and your common sense decide how long to air them.

Duck eggs usually pip 24 hours before hatching. Do not open the incubator after they begin to pip until the hatch is over; then open the door, not more than a quarter of an inch, and leave the ducklings for 24 hours before removing them to a brooder.

Brooding. A hen will give young ducklings the right care. If a brooder is used manage it the same as for chicks *except* that the temperature should be run a little lower, and that pine wood shavings are better than straw or clover for litter. Give the ducklings

a drinking fountain deep enough so they can stick their heads all the way into the water, and so keep their eyes and nostrils clean, but arrange it so they cannot climb in to bathe. A hen will teach her hatch how to drink, but when taking ducklings from an incubator, dip each one's bill in lukewarm water before putting it under the warm hover. Ducklings do not need brooding as long as chicks. As soon as they show signs of bunching up outside the hover, reduce the heat or remove the lamp entirely, putting it back on cold or rainy days until they are thoroughly hardy.

Feeding young ducklings. Their feed will always consist of wet mash made of 6 parts of bran, 2 of Red Dog flour, 2 of cornmeal, 1 of beef scrap and a little fine sand or grit. Mix these together dry, and make a mash of just what is needed for one feeding using cold or warm water according to the weather. Feed only as much as the ducklings will eat up clean at least 3 or 4 times a day.

Later care. When the ducklings are large enough to leave their mother or the brooder, put them on a patch of clover or other green crop enclosed by a 2-foot wire fence, and give them a colony house (p. 202) or shelter of some sort to protect them from rain or intense sun. Continue feeding the same mash according to their needs and keep them under these conditions until fully feathered. Then pick out the birds you want to use for breeding another season and turn them loose on the swamp land or range where the stream or pond is. Trees and shrubs will provide all the shelter they need until fall.

How to tell the sexes. In the colored varieties the males or drakes always have the more showy plumage. In the white varieties, the drakes have longer necks and bodies and stiffly curled feathers at the top of the tail. In all varieties the ducks do the loud quacking, the drakes making a hissing noise. One drake should be allowed for every 5 ducks for breeding purposes.

Care of breeding stock. About October first take the breeders from the range and house them in a barn basement, henhouse or other shelter that can be lined to keep the birds warm and their eggs from freezing. For nests place shallow, square boxes on the floor along the back wall, and fill with shavings,

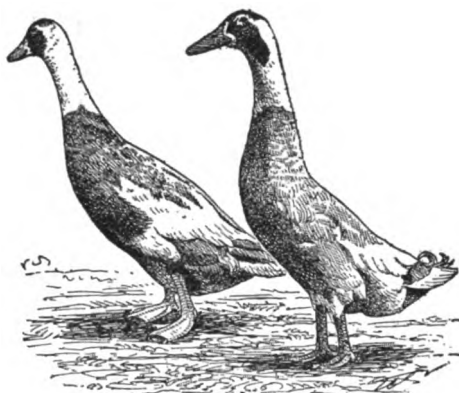


FIG. 270. Pair of Fawn and White Runner ducks

using plenty of shavings also on the floor of the house. Most of the eggs are laid in the morning and immediately covered with shavings. When housed the birds should receive a ration of 2 parts of bran, 2 of Red Dog flour and 1 each of gluten, cornmeal, oats, and beef scrap. Feed night and morning, mixing as directed for ducklings but using hot water. Give plenty of green feed at all times and a little whole corn in the middle of the day during cold weather. Keep oyster shell and sand before them at all times. Ventilate the house well, and except in severe weather let the ducks out after 9 o'clock every morning. If the natural water supply is frozen supply fresh water in the house. With good care the ducks should begin to lay by January. When enough eggs are on hand for hatching, the surplus may be used or marketed. When the breeders stop laying, about July first, kill and market them and replace with young stock to be used the following season.

Raising for market. After selecting the breeding stock, turn the rest of the young ducks into a yard fenced with 2-foot poultry wire (2-inch mesh), big enough to give them grass range at all times. All the shelter needed will be that of trees, bushes, or an open shed. Feed a mixture of 3 parts of cornmeal, 2 of Red Dog flour, 2 of bran, 1 of beef scrap, made as before into a wet mash. With plenty of green feed added they should be ready to market in 12 weeks.

Killing and dressing. Kill ducks the same as chickens, hanging them up by the feet and cutting the vein in the neck by inserting a sharp knife through the roof of the mouth (p. 195). Then scald and pick at once, separating the stiff feathers from the soft down. For shipping pack the ducks breasts up in barrels or boxes with plenty of ice. Dry and cure the feathers on racks or trays in a clean, airy place such as an attic. If not sold loose in the neighborhood they may be packed in muslin bags and shipped to nearby dealers.

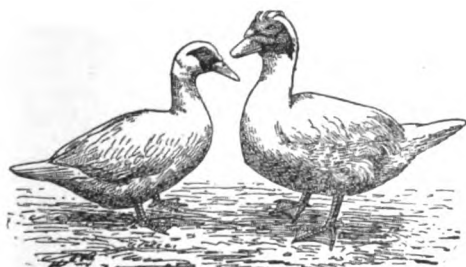


FIG. 269. Pair of White Muscovies

Commercial Duck Raising

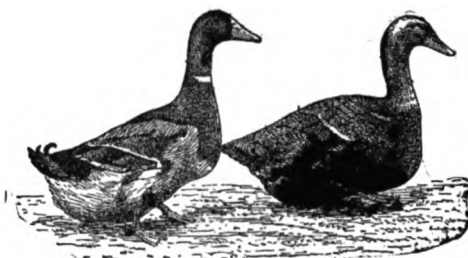


FIG. 271. Pair of Rouen ducks, the drake to the left

Important factors in duck raising as a business are: (1) A location within 12 hours by express of a large city. (2) Nearness to a village or railroad station from which feed must be hauled, as most duck feed is bought rather than raised on the farm. (3) A never-failing water supply. (4) A good supply of day labor for pickers. (5) Enough land to give plenty of pasture and to grow green feed to mix in the mash. If there

is enough to grow some grain on, so much the better.

General equipment. The *incubator room* or cellar should be 6 feet below and 4 feet above the ground level. The building may be carried up a story to give an office, storeroom, boarding house, etc. *Brooder houses* with overhead hot water heating systems are successfully used on many large plants. Any inexpensive, open-front building will do for the young stock, while the houses for the breeding stock should be about the same as the laying houses on a poultry plant. A concrete floored picking room should contain a scalding kettle, icing tanks, and refrigerator, and open into an ice house at one end; above it might be a feather drying loft. There should be a good sized building with a store room for feed on the second floor, and on the first a feed mill and dough mixer for preparing wet mashes. The engine for running these might also run a pump connected with a compressed air tank for forcing water to all the buildings. Each yard should have plenty of drinking fountains or troughs. The latter should have a slant of 1 inch to every 10 feet; by running the water in at the upper end a constant supply of clean water can be provided. The best way to feed wet mashes is in 12- to 14-foot troughs made of 1 ft. x $\frac{1}{4}$ in. boards with cleats across the bottom to keep them from moving. Troughs 3 feet smaller are best for ducklings. Provide enough of each so that the birds can feed without crowding. The Pekin is the leading commercial duck, standing confinement and forcing well and under this treatment often weighing from 5 to 6 pounds in 10 weeks. The feed mixtures, killing methods and other details of care are the same as for the farm flock only on a much larger scale.

THE RAISING OF GEESE

ALTHOUGH geese can be raised successfully, and as a rule cheaply in all parts of the United States, they are less common than formerly. When turkeys are scarce and high priced their popularity as a Christmas delicacy increases; foreign populations in and near large cities appreciate and raise them to a considerable extent. Geese are raised almost entirely on farms, in small flocks and as a side issue. About the only large scale goose industry is that of fattening birds for market, in which large numbers are bought from breeders and "finished" for a few weeks at some convenient point.

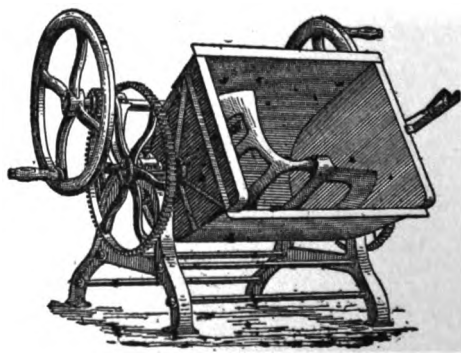


FIG. 272. A dough mixer used on large duck farms for mixing wet mashes

Conditions needed. Abundant grass range and water for them to swim in are even more essential for geese than for ducks. Low, wet pasture with a stream or pond, and as much freedom as possible over the rest of the farm are highly desirable. From 10 to 25 geese may be kept on an acre if plenty of vegetation is available.

Breeds. There are 6 recognized breeds of geese. A mongrel or hybrid, produced by crossing a wild gander on a goose of any other breed, which is not uniform and which, like all hybrids, is infertile, is very popular on the market.

African. An old breed of good size, active, rapid growing, with excellent flesh and market qualities (except for the dark skin and pin feathers); geese are good layers. Weights, old gander 20 pounds, young gander 16, old goose 18, young goose 14. Large knob at base of bill. Plumage brownish gray; head, knob, and bill black; shanks deep orange.

Chinese. Rather small, somewhat tender and reported shy and hard to handle. But excellent layers, rapid growers, and valuable for table use and feather production. Kept largely for ornament. Body short, upright, neck arched and carried upright; large knob at base of bill. Varieties; *Brown*, of different shades, lighter underneath; knob dark brown or black; bill black. *White*, with orange knob, bill, and shanks. Weights 12, 10, 10, 8 pounds.

Emden. Next to the Toulouse, the most popular and heaviest breed. Both ornamental and excellent for table or market. Geese only fair layers but the young grow rapidly and mature early. Neck rather long, carried upright. Weights, 20, 18, 18, 16 pounds. Plumage pure white, feathers valuable; bill, shanks, and toes orange.

Egyptian. Smallest of geese, sometimes classed as a duck. Little known in United States except for ornament. Weights 10,

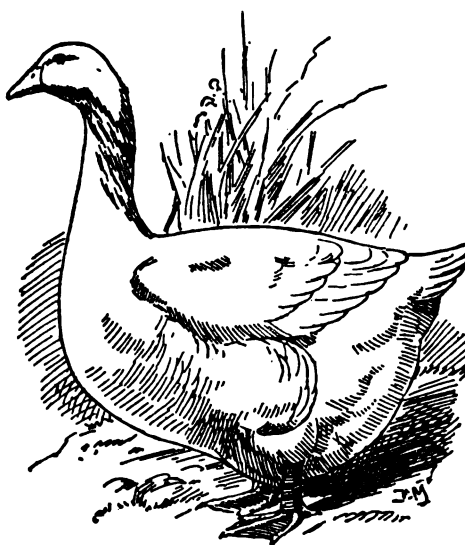


FIG. 274. Emden goose

8, 8, 6 pounds. Sexes much alike, but ganders are ugly tempered. Plumage a combination of chestnut, white, buff, black, and gray; bill, purple or bluish red eyes, shanks and toes orange or reddish yellow.

Toulouse. The largest and most popular farm goose. Of French origin. The birds are hardy, prolific, good breeders, but slower maturing than some, and are sometimes said to lack quality, except when young and well fattened. Body is of good length, broad, and very deep, in fat specimens nearly touching the ground; general appearance is massive. Weights 26, 20, 20, 16 pounds. Plumage gray, lighter underneath; shanks and toes are deep orange.

Wild or Canadian. Domesticated to the extent of being in the Standard of Perfection, but retains most of its wild characteristics and is sometimes hard to breed in captivity. Birds are strong, vigorous, mature quickly but are not prolific, laying but few eggs in a season; mate in pairs only. The head is small, neck long and arched. Weights 12, 10, 10, 8 pounds. Plumage mostly black and dark gray, with white on throat and under tail; bill and eyes black. (See Chapter 25.)

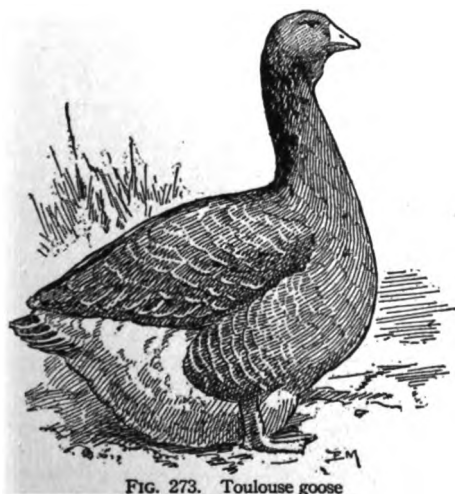


FIG. 273. Toulouse goose

The Care of Geese

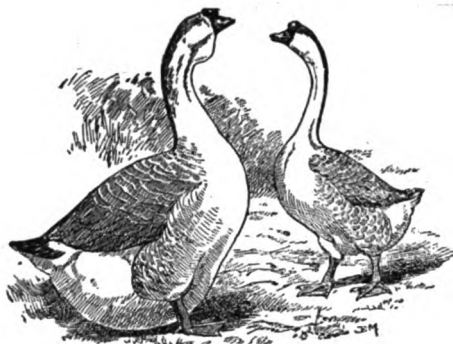


FIG. 275. African (left) and Chinese (right) geese

Breeding. A flock may contain 4 geese to every gander, but 2 or even 1 is much better. After choosing breeders carefully do not change matings from year to year unless results are unsatisfactory. Birds will breed when 2 years old, and for 10 or 12 years but ganders are not usually kept after they are 8 or 9 years old. Provide nests for the geese in late winter or early spring, either in boxes in their house or in barrels or other shelters. The first eggs are often hatched under hens, 3 or 4 to a hen, the last 10 to 15 being left for the goose. It is said that if they are taken away promptly she will lay more. The incubation period is 28 to 30 days. Test eggs the tenth day and sprinkle them daily after the first week if under a hen or in an incubator, which should be run at 101.5 to 102.5 degrees F. A goose will generally take good care of her hatch and the gander will look after and guard her, but if the eggs hatch unevenly it is well to take the goslings away as they appear and keep them in a warm place to prevent their being injured until the hatch is completed. It is desirable to have the hatches come off as soon as possible after the pastures are in good shape.

Feeding. When goslings are 24 to 36 hours old they may be fed bread crumbs soaked in sweet milk and squeezed nearly dry, or any simple mash as suggested for ducklings. If kept in coops for safety they should be given finely cut grass or other green feed, grit, and water. After a few weeks they will be able to range for most of their feed, but any standard mash in addition will stimulate rapid growth and increased size. A few weeks before selling or marketing a fattening ration of 1 part shorts, 2 parts corn, and 5 per cent meat scrap, by weight, will give good results. Fattening geese are often confined, in which

case they must be given green stuff frequently.

About February, breeding stock may be fed for egg production a mash of a pound each of cornmeal, bran, and middlings or low grade flour and 10 per cent beef scrap in the morning and corn or corn and wheat, equal parts, at night. Any roots or waste vegetables are valuable for winter feeding or when there is no pasture.

Buyers who specialize in fattening young geese usually keep them in pens of 6 or 8, for 3 weeks or so, and feed them several times a day a sort of "noodle," consisting of ground wheat, 1 part, ground, sifted oats 1 part, cornmeal 2 parts, and enough low grade flour and water to make a stiff dough, which is molded into long strips, cut up, boiled like dumplings and fed warm and wet. Sometimes hopper feeding is practised in large pens bedded down with straw.

Marketing. The best demand is from Thanksgiving to Christmas, though young geese are readily marketable from June to January. Well bred goslings may be forced to weigh 10 pounds at 10 weeks of age, at a cost of 3 to 6 cents a pound. Killing and picking is done as with other poultry though geese are often stunned by a blow on the head after being stuck in the roof of the mouth. If the market permits they may be steamed or scalded slightly to make picking easier. When picked and washed they should be kept in ice water for 2 hours or so.

Feathers. Though the demand seems to have decreased, goose feathers sell for 30 cents to \$1 a pound, white ones bringing the most and scalded ones somewhat less. The practice of plucking live geese, though condemned by many, is practised extensively in the South and less in the Middle West and North. Some breeders do it but once a season, others every 6 weeks or so except during the breeding season. The average annual yield is about a pound but the wisdom and profitability of this practice has not been definitely proved.

Investment and returns. Geese are hardy, rarely attacked by disease or insect pests, can be kept and fed very cheaply most of the year, require only the simplest shelter from severe weather and storm, and can almost always be marketed at a fair profit, together with their feathers and any surplus eggs. Data from some 300 breeders show that in the South geese marketed alive brought an average of 76 cents in 1916, returning a net profit of 49 cents, while farther north geese so marketed averaged \$1.82 and returned a profit of \$1.16 each.

CHAPTER 23

Pigeon Raising and Squab Production

By P. B. RUGGLES, Wyoming, Ohio, a practical, experienced pigeon enthusiast, who combines the profitable breeding of high class market squabs with the interesting activity of crossing breeds and developing improved types.—EDITOR.

WHAT pigeon raising means. The business of breeding pigeons offers generous profits, but both it and the birds must be well understood before it is gone into extensively. There is a false impression—unfortunately supported by misleading, unreliable advertisements—that any one can succeed with pigeons and quickly amass a handsome fortune therefrom. Let no one take up the work with such an idea in mind, or he is likely to add his name to a long list of failures. Start on a small scale, increasing as experience and returns warrant; be prepared to invest careful judgment, intelligent care, and plenty of work.

The pigeon industry has two branches; the breeding of squabs for market, and the raising of breeding stock for sale. The first brings the surest and quickest returns, squabs being safely turned into cash at 4 weeks of age. The second requires more room for raising the young, also more care, more feed, more cleaning of the houses, more advertising, and often involves more losses; but it offers freedom from the unpleasant weekly task of killing and dressing, and better prices for stock sold, if of good quality. Squabs bring from 40 cents to \$1.20 per pair according to size; good mated breeders bring from \$2.50 to \$15 per pair according to the parent stock. Prominent breeders get enormous prices for special birds, but only long and successful experience makes this possible or justifies the purchase of such stock.

The following pages discuss chiefly the squab raising or utility phase of the industry; but the same general directions apply to the raising of fancy breeds for show purposes, recreation, or sport. Of the many breeds and types of fancy pigeons, the most popular are the Fantail, Pouter, Pigmy Pouter, Carrier, Jacobin, Archangel, Magpie, Nun, Swallow, Trumpeter, Barb, Turbit, Owl, and Frillback. Among the so-called sporting breeds are the Flying Homer, the Tumbler, the Tippler, and the Roller. Runts, Maltese Hens, Show Homers, Dragoons, and Duchesse are bred as either fancy or utility stock.

Breeding Stock for Squab Production

There are varieties to suit all markets and the beginner should study the demand he is to supply before choosing his stock. If an eight-pound-to-the-dozen squab is most salable, select Homers; if a ten-pound-to-the-dozen, choose Extra Large Homers, Maltese, Dragoons, or Duchesse, or Carneaux, Mondaine and other of the numerous cross-

bred strains; if a twelve-pound-to-the-dozen, Runts, Runt-Maltese crosses, etc., are all good. The special advantages of cross-bred stock are uniform and increased size, vigor, and tameness.

Select breeders with great care; there are lazy, worn out and worthless individuals in all breeds. Economize, if you must, on the number of pairs, never on the price of the birds, for cheap stock produces few and unde-

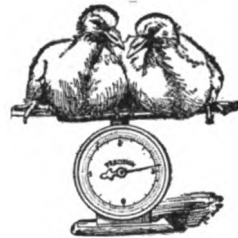


FIG. 276. A pair of 4-weeks old White Runt squabs weighing nearly 3 pounds.

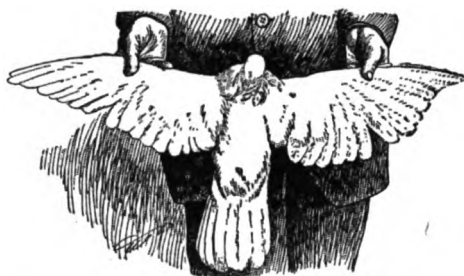


FIG. 277. Contrary to its name, the White Runt pigeon is the largest of all breeds

sirable squabs, may breed disease and in many cases soon wears out. Avoid odd, job lots of pigeons, and, in general, large dealers

who are known to buy up all sorts of cheap birds for reselling. If possible attend shows and study types and breeds, selecting thereafter from stock raised by reliable breeders. Buy in small quantities (5 to 10 pairs is enough at first) and *only mated pairs*. It is well to buy from several sources rather than one, in order to obtain different lines of breeding and insure healthy, vigorous young stock in future. If possible insist on having "seamless banded" birds (p. 236); open bands of metal, celluloid, etc., may be put on at any time and do not guarantee the bird's age. Two-year-old breeders are best, yearlings second best. Reliable dealers guarantee their pairs to be mated and good breeders; never accept stock showing defects or any sign of disease. Late winter to very early spring is the best time to start with pigeons or to buy new stock.

The Pigeon Loft

The site is as important as the building itself; choose a high, dry spot with good drainage where the flying pens may be on the south or east side of the house. If one or two sound trees are in the way of the pen they need not be removed. Simply take off the lower branches and build around them; the top will provide desirable shade in summer.

The building. The design and size must depend on (a) the number of birds to be kept and (b) the taste of the owner or the style of surrounding buildings. For a small beginning, with probable growth in mind, a good pen is a simple shed roof affair 8 feet high in front, 6 in the rear, and 15 x 15 feet in size, as shown in the diagrams. This makes a unit which may be added to as fast as necessary, a solid board partition being built between each 2 pens. A pen will hold 24 pairs of large breeders or 28 of small, providing the combination grit, water, and feed box (Fig. 278) is used, and the floor space left entirely clear. If no stock is to be raised above squab size, or if it can be kept elsewhere, the adjoining nursery pen may be changed into a breeding pen by substituting nests for perches. A good plan for the beginner in such a case is to start with one breeding pen, use the second as a nursery the first year, then turn it into a breeding pen the second season.

Construction. A solid concrete foundation is best, but cedar posts or brick or concrete piers can be used. The floor should be at

least 8 inches from the ground, double, with matched boards on top; nail 12-inch strips of tin bent at right angles down the middle,

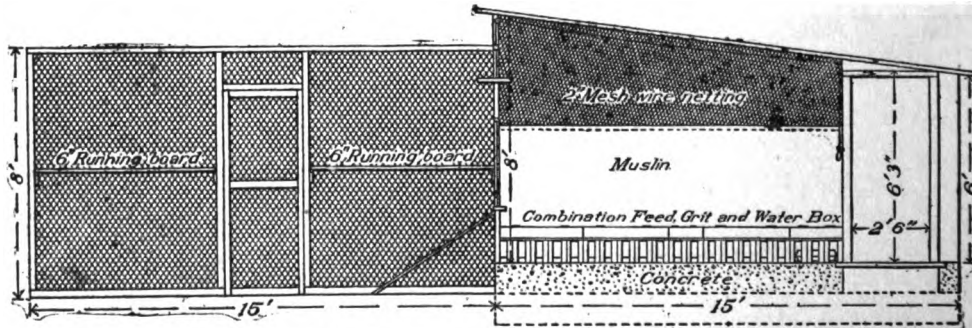


FIG. 278. Side view of a pigeon house and pen as described in the text, showing construction of partition and feed box between nursery and breeding pens

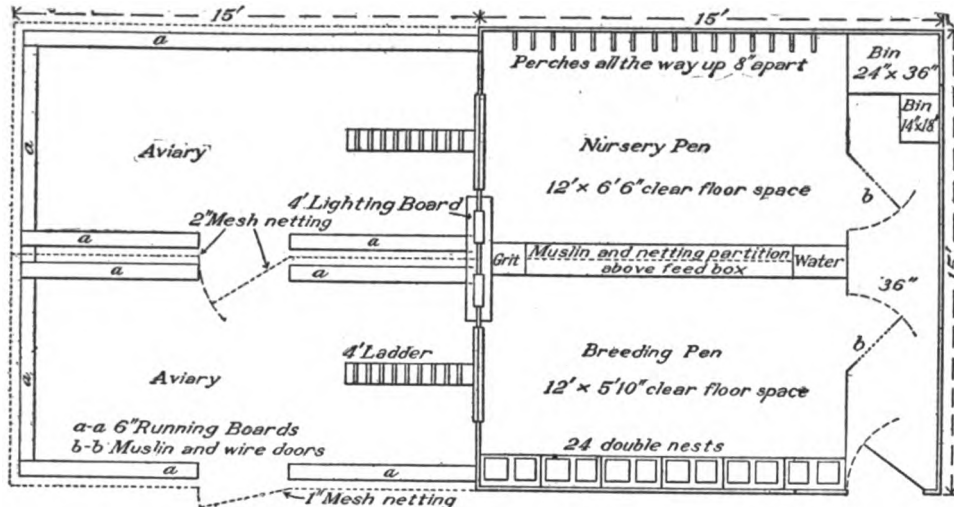


FIG. 279. Plan of double house and pens, *a* run; *b* doors. For construction of perches see Figs. 282 and 285; and of nest boxes see Fig. 283

between the two floors all the way round to keep out rats and mice. The *siding* should also be double with sheathing paper between. In mild climates heavy tarred building paper may be used in place of the inside matched boarding. The *roof* should also be of matched stuff and roofing paper, or shingled—in which case it must have a steeper pitch than 2 feet in 15. To prevent cross draughts put two 6-light *windows* as close together as possible in one side of the double house (toward the flying pen) to admit light and air and provide a large flying exit for good weather. Hang the sash to swing outward, have long hooks outside to keep the windows rigid when open and smaller ones to keep them closed, and reinforce the sash at the corners with 8-inch "L" shaped irons to prevent sagging. Sliding windows are much used but cannot be made as tight as hinged ones. *Inside partitions* are of good unbleached muslin for the lower 36 to 40 inches, and two-inch mesh poultry netting the rest of the way to the roof. The partition between breeding pen and nursery starts on top of the combination feed box, not at the floor. The *inner doors*, 2½ x 6½ feet, are also of muslin and netting, swing out into the passage, and are hung each on one spring and one plain hinge with hooks or buttons to fasten them shut. The *small exit* from each pen, 6 x 12 inches, is high and close to the centre partition, and is closed by a sliding door operated by means of a cord run through eyelets and pulleys and carried out to the passage where it can be easily reached. The tiers of *nests* should start a foot from the floor, the space below being covered with slats so the birds cannot nest in it. That it may be frequently cleaned out,

the slats should be attached to one or two removable frames. The nests are built up like book shelves; each shelf, 12 inches wide and the length of the pen, is of tongued and grooved boards held together by pairs of cleats nailed on the top and bottom of each shelf (except the top one which is cleated on the bottom only and the bottom one, cleated only on top). Each pair of cleats is separated just enough to admit a partition 12 x 12 inches, and so spaced that the partitions stand 2½ feet apart. Thus 5 shelves and 25 partitions make 25 double nests each 20 x 12 x 12 inches, which can be put together without hammer or nails, except in boarding up the end next to the passage. The advantage of this unit system is that as many or as few nests as desired may be put up and added to at any time with the least possible hammering and disturbance of the birds and injury to the eggs. A beginner with 6 pairs will need one row of nests; later he can add another to take care of 6 more, etc., never providing more nests than there are pairs. It seems part of the pigeon's nature to appropriate as many nests as possible, but if allowed to have more than 1 a pair is more liable to neglect its family and cause the breeder considerable trouble when he tries to move it to make room for more.

The *nursery pen* contains no nests, only perches (the breeding pen has no perches) which are 1 x 3 x 6 inches, fastened end on against the wall, 8 inches apart each way; use 3 nails for each perch, 1 driven from either side and 1 from the top.

The combination feeding box placed between and supplying both pens, is 16 inches wide and 12 high, the hinged cover overhanging about 2 inches. A 2-inch strip around

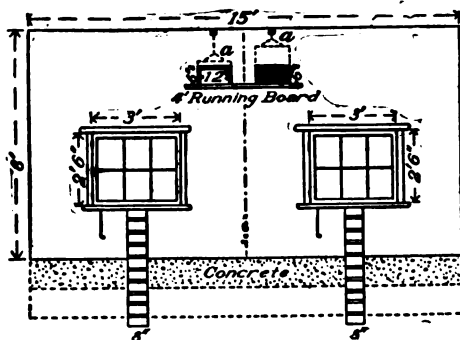


FIG. 280. Plan of end of house connecting with flying pen, showing windows, ladders, alighting board and small flying exits which are closed by means of sliding doors worked by cords from the passage inside.

the bottom prevents feed and grit from being thrown out on the floor. Upright slats to keep the birds out are spaced according to the size of the breed; for average pigeons nail 2 laths close together; then leave a space the width of 1, then nail 2 more, etc. Use about 14 inches next the passage for drinking water, sliding a shallow enamel pan in from the passage; use 16 inches at the other end for grit, charcoal, and salt (p. 235). Divide the space between down the centre with a $\frac{1}{2}$ x 4 inch board to keep the feed for one

pen separate from that for the other. The hinged cover is best made in 2 sections and need only extend over the feed part of the box, the grit being put in from the side. Cleaning is easier if the hinges are placed under the top.

The *flying pen* or *aviary* is 15 x 15 x 8 feet, with a frame of 2 x 4's, the corner joists being set on tarred posts set 8 inches deep. Enclose with tightly stretched 1-inch double galvanized wire, and make door and partition between pens of 2-inch wire. Place 1 x 6 inch running and alighting boards all around the inside about 4 feet from the ground and 2 inches from the wire so the birds will not muss their tail and wing feathers. A strip of strongsheeting or canvas may be tacked across the netting next to the house to keep out driving rain, snow, or extreme heat. To give good drainage make the floor of the aviary of 3 or 4 inches of clean sand, underlaid with 6 inches of coarse cinders. A "ladder" or heavy board 6 or 8 inches by 5 feet with cleats every 2 inches should run from the ground to the window ledge where it is securely nailed. Climbing this is a great strengthening and lung and chest developing exercise for the birds.

Makeshift quarters. If a special building cannot be provided, a part of a barn or other outbuilding may be used as shown in Fig. 281. It must be dry and rat and draught proof, and the flying pen must extend to the ground.

General Management

Feeding. Feed pigeons twice a day, as early as possible in the morning and at 3 or 4 o'clock P. M. Give only as much as they will clean up in half an hour, and if any is left over give less at the next feeding. Never feed on the floor or out in the fly. Some breeders use open trays on the floor or on tables 2 feet high, which must be scraped clean of all droppings before each feeding if they are to be any better than the floor. The best plan is the covered feeding box above.

All grains fed must be thoroughly seasoned, hard, and dry and are best bought in late spring. Musty, moldy, mousey feed will surely cause heavy losses of both old and young birds. Cracked maize and kafir corn should not be stored in quantity as they have a tendency to heat and become moldy. Hard wheat and sifted cracked corn form the basis of all pigeon rations. Kafir corn, Canada peas, hulled oats, buckwheat, vetch, millet, hempseed and rape are also used. Where only a few pigeons are kept a ready mixed pigeon feed may be purchased, but for more than 5 or 10 pairs it is expensive. Good home mixed feeds are:

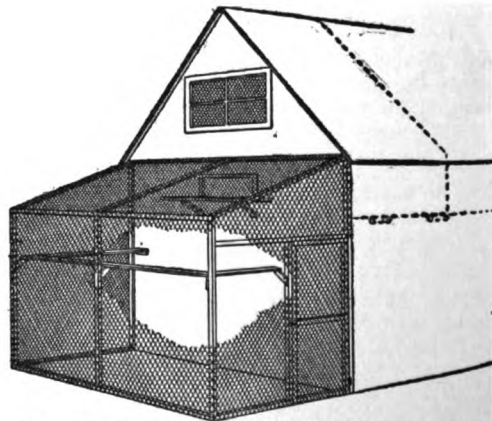


FIG. 281. How to use a small part of the barn or other building for pigeons

FOR WINTER

1 bu. wheat
100 lb. cracked corn
25 lb. kafir corn
20 lb. Canada peas
10 lb. buckwheat
5 lb. millet
5 lb. hempseed

FOR SUMMER

2 bu. wheat
50 lb. cracked corn
25 lb. kafir corn
20 lb. Canada peas
10 lb. hulled oats
5 lb. millet
5 lb. hempseed

In very cold weather add whole corn to the afternoon feeding. Grains that should *not* be fed are rye, unhulled oats, barley, broom corn, pop corn and green peas. Hopper feeding is not advisable unless the keeper must be absent over feeding time, in which case only the one day's supply should be left on hand.

Grit and charcoal. A generous, unfailing supply of sharp grit and charcoal is as necessary as feed. The "health grits" on the market are not by themselves sufficient. The following mixture is inexpensive and meets every need: 100 pounds mica or crystal grit (sharp); 100 pounds oyster shell (pigeon size); 25 pounds good commercial health grit; 25 pounds charcoal (pigeon size).

Salt. Pigeons require salt but too much is more harmful than too little. A lump of rock salt placed in the centre of the grit box draws moisture from the air and gives the grit the slightly salty flavor that pigeons crave and no more. Never sprinkle it with water. Loose table and crushed rock salts are unsafe and the old time "salt cat" is troublesome to make and unnecessary.

Water. Give a fresh supply of water with each feeding in a vessel that can be kept *thoroughly clean*. A good plan that makes scalding unnecessary is to hang a clean paint brush near the drinking pan and each night wipe the sides and bottom of the pan with it, then rinse the vessel and leave it upside down to dry. If the combination feed, grit, and water box is not used, a special, slatted box should be made to cover the drinking pan.

The bath. Pigeons are very fond of bathing and a large shallow pan should be kept in the flying pen. A galvanized iron vessel 2 feet square and 5 inches deep will generally serve. Empty it after the bath and turn it over so the dirty water will not be used for drinking.

Cleaning and vermin. Clean the loft well once a week, scraping all exposed places with a three-cornered loft scraper or sharp hoe. After removing the manure dust slaked lime around; occasionally give the pens a good coat of whitewash. Body and feather lice and mites prey upon pigeons kept in filthy quarters and denied a frequent bath. Squabs are sometimes actually "eaten alive" and old birds so worried they are unable to sit on eggs or young. To prevent this dust the birds with a good insect powder twice a year, either by hand or in a special lice killing machine, and keep the pans clean and the

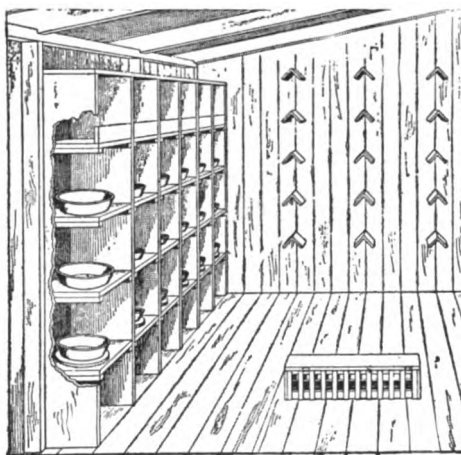


FIG. 282. Inside a pigeon house showing nest boxes and pans, roosts, and covered feed or water trough. (Farmers' Bulletin 684).

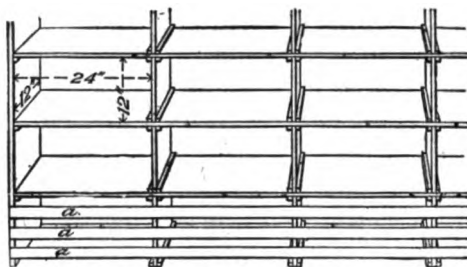


FIG. 283. Lower tiers of a stack of nest boxes with open space below protected by slats (a)

this test is not always infallible. The hen has laid.

Mating. Pigeons breed in pairs and any unmated birds of either sex in the breeding pen will greatly disturb the workers and cause considerable loss of eggs and squabs. The cock and hen selected for mating should be confined together in a small pen or in the double nest they are to occupy in the breeding pen, for several days until thoroughly mated.

Nesting. When a pair is mated the cock bird drives the hen about the pen almost constantly, hardly allowing her to eat and drink. He is not satisfied until she returns to the nest, and keeps up the driving until the first egg is laid. Fine tobacco stems, straw, or hay may be placed within reach though many breeders discourage this nest building because of the bulk of litter to be removed at cleaning time. Nest bowls with a handful of shavings in each are often used, or the breeder may make a good permanent nest 8 inches square out of a frame of two-inch strips covered with burlap that is easily renewed after a season's use.

Hatching. Pigeons lay 2 eggs before sitting, 2 days apart. The period of incubation is 18 days during which the cock sits on the eggs from the middle of the forenoon until mid-afternoon, and the hen the rest of the time. For the first 4 or 5 days the tiny squabs live on "pigeon milk," a creamlike substance that forms in the crops of both parents at the end of the hatch. The old bird takes the baby's beak gently into its own and pumps the soft feed slowly into the little mouth. After this milk is fed off, half digested grain is pumped into the squab and later whole grain with water and grit.

Banding. Each squab that is to be reared for breeding should be banded when about 2 weeks old with a seamless metal ring bearing a number and the year it is hatched. To do this hold the 3 front toes together and slip the band over them, holding the back toe up close to the leg until the band is slipped up over it.

Keeping records. A Nursery Record and a Loft Register each kept in an ordinary stenographer's book are necessary, though large cards tacked up in each pen may be used in place of the Register. At the beginning of the breeding season each pair should be given a page in the Register headed thus:

Pen 1.....Nest 1.....1917

111 } cock 29	108 } hen 62
78 }	84 }

nest disinfected with kerosene, turpentine, diluted crude carbolic acid, or a few moth balls.

Distinguishing sex. The male may be distinguished from the female by its larger, coarser appearance, thicker neck, and coarser head; it does the most and loudest cooing and all the "driving." It is said that if a bird is held with its feet in one hand and the beak in the other and raises its tail, when suddenly stretched it is a female, but the only way to be sure is to wait until the



FIG. 284. Two White Runt pigeons and a Homer (in front) of the same age.

which reads that nest 1, pen 1 contains for the year 1917, cock 29 from parents 111 and 78, mated to hen 62 whose parents are 108 and 84. The page gives ample space for recording dates eggs are laid, number of squabs reared and their band numbers if they are banded. The Nursery Record contains all needed information about each bird. Begin with the stock birds, then record all youngsters as soon as they are transferred to the nursery, and their sex at mating time. When a bird dies or is sold draw a line through its record.

NURSERY RECORD

NO.	SEX	VARIETY	PARENTS	BORN
29	cock	Homer	111 & 78	Apr. 1915
62	hen	Homer	108 & 84	Mch. 1915
33	cock	Homer	29 & 62	Feb. 1916
34	hen	Homer	29 & 62	Feb. 1916
91	hen	Homer	45 & 22	Apr. 1916

The value of the Nursery Record is apparent at mating time for mated pairs must be unrelated in order to produce hardy stock. Thus Cock 33 must not by any chance be mated to Hen 34 although such a mating would doubtless be the preference of both birds.

Care of young birds. Feed the same as old birds *omitting peas and hemp*. Most troubles in young stock arise in the digestive system, gorging and lack of exercise causing usually fatal intestinal diseases. Feed twice a day but never all they will eat, of clean, sound grain, and keep mixed grit always in reach. Allow very young birds to bathe only on warm, sunny days and then for but a short time while the sun is warmest. Let no young birds spend the night on the floor; put them on perches after dark if necessary.

Molting. Pigeons begin to cast their old feathers in July and August and if properly cared for should be in good feather again by November. This period should be one of

complete rest from all family cares. Stop all nesting and squab raising by removing all newly laid eggs and nesting material. Feed as much mixed grain as the birds will eat, with the addition twice daily of a pint of millet and hemp seed to each 100 birds.

By-products. Pigeon manure is much sought by florists and tanneries; investigate the local market and store it so as to suit the purchaser. In any case keep it dry and free from sticks, straw, etc. The old price of \$1.00 per cwt. has increased in some sections but even at this price or less it is worth saving and caring for. All feathers have a market value and should be saved and sorted, the quills and very coarse feathers being kept apart from the fine body feathers. Even very old or dead pigeons have a value, for taxidermists can always use white birds of any size, and colored ones that may be stuffed, dyed and used whole or of which parts may be used for millinery purposes. Blood collected from the weekly squab killing is mixed with double its bulk or more of cornmeal, dried thoroughly, powdered and sold as an egg producing poultry feed.



FIG. 285. Corner of nursery pen showing perches attached to wall and to roof beams.

Marketing Squabs

Squabs are ready for market at 4 weeks of age, just before they are ready to leave the nest. They have then attained their heaviest weight and if allowed to fly soon lose weight and develop dark flesh.

Killing. Collect the squabs from the nests in a coop the day before they are to be killed so their crops and bowels will be quite empty. A high shelf against the wall or a narrow table with a high, solid back is convenient for the work. Provide stools of the right height and receptacles for feathers.

At a convenient height above the shelf or table top drive 4 nails in the wall 4 inches apart and from each nail suspend a strong cord 6 inches long with a slip noose at the end. Place the feet, tail and wings of a squab in one loop and tighten the cord firmly. Hold the squab with its back to the wall and its mouth open with one hand, and with the other insert a thin, sharp bladed knife far back in the roof of the mouth, cutting toward you and deep into the brain, causing a free flow of blood and making the bird instantly unconscious. Have ready at hand 4 short wires sharp and hooked at one end and weighted at the other with a piece of lead about the size of an egg. Hook one into the bill of the squab and let the blood flow into a pan, while killing the next squab.

Dressing. When 4 squabs have been killed, begin at once to *dry* pick the first one. First remove the wings from the noose and tighten the cord again firmly. Then holding both wings back of the body with one hand, pick clean the front, legs, and neck up to within an inch of the head. Turn the bird over and pick the back clean; still holding the wings together in one hand, pull out the



FIG. 286. A White Runt cock weighing nearly 3 pounds

flights and large feathers; then finish picking the wings separately. Remove the weighted wire, take the squab from the noose and pull out the tail, and any remaining pin feathers. Fold the wings across the back and drop the squab at once into cold water to cool and plump. After picking 3 squabs kill 3 more so they may bleed while the fourth is being picked; continue alternately killing and picking until all are finished. When all are picked, cleanse the mouths and feet and dip the squabs into fresh cold water for a few minutes; spread them on drying racks or tie them in pairs by the feet and swing them over a line in a cool place, away from flies and direct sunlight.

Shipping. If to be marketed locally, the squabs need only to be sorted as to size and wrapped in white paper for delivery. For shipping place cracked ice in the bottom of barrel or box, then a layer of squabs, breasts up, then another layer, breasts down, a layer of cracked ice and another double layer of squabs. etc., always finishing with cracked ice.

Disease among pigeons is more easily prevented than cured. The general causes are dampness, draughts, unclean or crowded quarters, moldy or too new feed, slimy drinking vessels, inbreeding, unhealthy parent stock and over feeding. It is not good to be continually giving drugs, though a good tonic may be given all the birds occasionally in the drinking water with good results.

A sick pigeon is easily recognized; it has a general appearance of misery, standing around in a huddled position, feverish, glassy-eyed and without appetite, should immediately be removed from the pen and carefully examined for the following diseases:

Roup, an extremely contagious disease of the nose and throat, caused by insanitary quarters, dampness, bad ventilation. *Symptoms*—watery and swollen eyes, running at the nose. *Treatment*—remove to a warm dry place apart from the flock. Give a pinch of Epsom salts daily. Feed a light diet, with a few crystals of potassium permanganate in the drinking water.

Cholera, a dangerous disease that often destroys a whole flock in a short time, caused by filthy drinking vessels, moldy feed, new, unseasoned wheat, corn, etc. *Symptoms*—severe diarrhea; emaciation. *Treatment*—remove and give twice daily 3 drops of "hot drops" such as Jamaica Ginger on a piece of charcoal as big as a grain of corn; feed lightly.

Worms. Squabs or old birds that eat heartily but are very thin have intestinal worms. Feed lightly and give a pinch of worm seed twice daily for 2 days, then castor oil in a No. 2 capsule.

Going Light a wasting away disease that resembles consumption, occurring mostly among young birds, and caused by overfeeding and lack of exercise or foul water or feed. *Symptoms*—high fever and severe chills; watery and mucous discharges; difficult breathing; emaciation. *Treatment*—this disease can be

cured only in its earliest stages before inflammation of the lungs has set in. At its first indication give a No. 2 capsule filled with phosphate of soda each morning for 3 days; diet lightly.

Canker an incurable hereditary disease much dreaded by pigeon fanciers. *Cause*—tainted stock transmits it through the egg. *Symptoms*—external and internal growths of solid yellow matter streaked with blood, appear commonly in the ear, throat, head, near the eye, etc. *Treatment*—birds may be cured to all outward appearance but sooner or later it appears again. The best plan is to kill all birds that are known to breed cankered young or that show canker and thus stamp out the disease once and for all.

Diphtheria, a disease of the throat often mistaken for canker, attacking 2 or 3 weeks old squabs and caused by sudden changes of weather, cold, and dampness. *Symptoms*—throat and neck are red and much swollen, causing difficult breathing; thick, yellow discharge from mouth. *Treatment*—bad cases cannot be cured but light cases may be by swabbing out the throat several times daily with cotton dipped in witch hazel. Stubborn patches may be removed by dusting with baking soda and swabbing them off after a few minutes. Disinfect the drinking water by adding enough potassium permanganate to turn it a bright rose color.

Squab Tonic. A half ounce of copperas, 4 ounces of sulphate of soda, $\frac{1}{4}$ ounce of powdered gentian root, 2 ounces of phosphate of soda, 1 drachm of pure creosote (beechwood). Thoroughly mix the creosote in a mortar with 40 grains of calcined magnesia, so that it will mix with water; pour into a gallon jug, add 2 quarts of warm water, then the other ingredients, and mix thoroughly by rocking the jug. This will keep for years in a cool place but not in a metal container. Add one tablespoonful to a gallon of drinking water once a week.



FIG. 287. A robin illustrating the proverb about "an early bird." (Farmers' Bulletin 630)

CHAPTER 24

Birds on the Farm

By ARTHUR A. ALLEN, Assistant Professor of Ornithology (the study of birds) at Cornell University, bird editor of the *American Forestry Magazine* and author of many papers on the economic problems of bird life, especially on the farm. His information, like that of the most practical scientists, is based on observation and study of conditions in the field over a wide range of country. He knows the birds he writes about.—EDITOR.

NO NATURAL product of the American farm has received less attention, and yet is more worthy of consideration, than its bird life. Wild plants, animals, and even fishes have been developed, by human skill, into wealth-producing factors. Except for the turkey, however, little thought has been given to the hosts of feathered creatures which, of their own free will, flock about the farm. It is time to assume control of bird life and draw from it the best that it can produce. Few species will prove of value for food or domestication but these are only two of the many rôles which birds play. Far more numerous and valuable are those which serve as protectors of the forests, fields, orchards, and gardens.

The various states and even the Federal Government have gone so far as to give protection throughout the year to insect-eating birds, but even this excellent legislation is only a step in the right direction; the people must do their share. Not only should valuable birds be protected, but every effort should be made to increase their numbers to a point at which the maximum benefit is derived. Similarly, the destructive species should be reduced to a point where their devastations are more than balanced by their usefulness. Distinguishing between the beneficial and destructive species requires careful study because frequently a very beneficial species appears, for a short time, in a destructive capacity and leads one to a false conclusion. This chapter aims to point out the differences between the useful and harmful species and to show how each may be controlled to the benefit of the farm.

Bird Friends

1. **Game birds.** Birds are useful about the farm in four general ways. First, there are the game birds which supply meat for the table. When first settled America was the richest game-producing land of the world, but its wealth has been so wantonly devastated that to-day, because of ignorance and inexperience, the game on most farms is negligible. Yet on a properly conducted farm enough pheasants, grouse, quail, prairie chick-

ens, or wild ducks could support themselves, even with benefit to the crops, to supply meat for the table during the hunting season, or a small income to the farmer if he preferred to lease the hunting rights to others.

2. **Insect destroyers.** Many and varied are the insects which destroy fruits, grains, and other crops, doing thereby enormous damage. Of the 176 different species that prey upon the apple tree alone, one, the codling

moth, has been estimated to do about 20 million dollars damage yearly in the United States, while the total destruction to crops and forest products by insects is placed by Government authorities at more than a billion dollars annually! Were it not for natural enemies of the insects, chief among which are the birds, the earth would be overrun, all vegetation would disappear, and successful agriculture would be impossible. Fortunately, each group of insects has its parasites and enemies that prey upon it. No matter where the insects hide, nor how large or small they are, there is some bird to seek them out and destroy them. Root worms or white grubs living in the soil are dug from their burrows by meadowlarks, crows, and grackles; army worms or cutworms nipping off the sprouting grain are in turn nipped off by bobolinks, blackbirds, larks, towhees, robins, and several species of ground-frequenting sparrows; cabbage or currant worms or potato beetles crawling out of sight among the leaves are found by bush-frequenting catbirds, song sparrows, and rose-breasted grosbeaks; tent



FIG. 288. A yellow bellied cuckoo helping the farmer by destroying a nest of tent caterpillars

caterpillars and elm-leaf beetles devouring the leaves are picked from their hiding places by cuckoos, orioles, and waxwings; and borers tunneling into tree trunks and branches are dug from their retreats by woodpeckers armed with chisel-like beaks. The hawk pounces upon the largest beetles and locusts; the owl upon the giant moths; while the chickadees and warblers seek out the smallest aphids and scales and the tiniest insect eggs.

But what do we do to maintain this feathered police force? Scientific horticulture demands, rightly enough, that all dead branches be cut out of the orchard and all holes be cleaned and filled. But with the dead branches go the nesting sites of the woodpeckers, blue-birds, crested flycatchers, wrens, chickadees, nuthatches, and tree swallows which, unless something is done to hold them, must move on to more desirable locations. When practicing scientific horticulture, then, carry your science a step

further; provide artificial quarters for the birds whose natural homes you have destroyed and retain the assistance of their keen eyes and insatiable appetites.

To gain an idea of the work these hole-nesting birds do, consider the case of a family of wrens watched by a bird class in Macomb, Ill., from 3:45 A. M. to 8 P. M. on the last day that the young were in the nest.* There were 7 young to be fed, all by the male bird as the female had been killed previously by a cat. The number of trips made by the parent with food for the young, hour by hour, was as follows: 85, 99, 88, 79, 93, 111, 78, 70, 98, 74, 56, 59, 44, 72, 80, 31 or a total of 1,217 in 15 hours of daylight. This is an unusual number and would of course have been impossible had there not been a rich feeding ground near by. A scarlet tanager has been seen to eat 630 gypsy moth caterpillars from one tree in 18 minutes; and a Maryland yellowthroat was seen to eat 3,500 plant lice in 40 minutes—at the rate of 5,270 an hour!

3. Seed and fruit eaters. Among the birds that feed on seeds and fruits are many, like the crows, blackbirds, and sparrows, which live largely upon insects during the summer, changing to a seed and fruit diet when the insects fail. Were it not that grain fields and cultivated fruits tempt certain of them, this group as a whole would be highly beneficial because of the great quantities of weed seed it destroys. The late Professor Beal, of the United States Biological Survey, concluded that a single species of seed-eating bird, the tree sparrow, destroyed in the state of Iowa alone, more than 800 tons of weed seed every year. This service should not be forgotten when some individuals of the group pilfer from the grain stacks.

4. Rodent eaters. This last group includes the hawks and owls. If we consider the reproductive capacity of the common meadow mouse, we see how necessary is some constantly active check upon their increase. From 5 to 7 litters of 5 to 8 young apiece are produced each year. At the rate of 35 offspring a year per pair, one unmolested pair, within 5 years, would have



FIG. 289. The downy woodpecker seeks out and destroys many insects hidden in branches of trees.

*See The Auk, Vol. XXXIV.—p. 90.



As profitable breeding stock



As a companion and protector

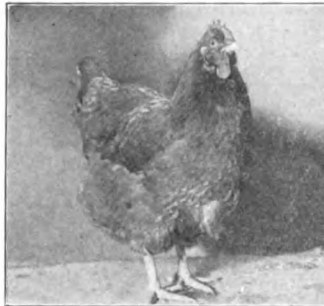


In hunting

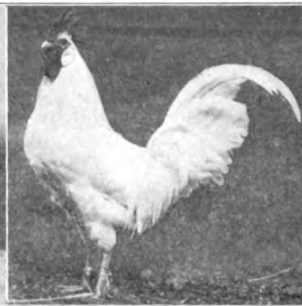


In handling and guarding stock

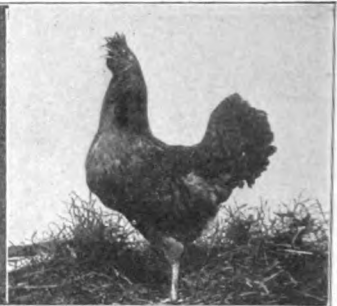
FOUR WAYS IN WHICH THE RIGHT KIND OF DOG CAN SERVE THE RIGHT KIND OF FARMER



S. C. Rhode Island Red Hen



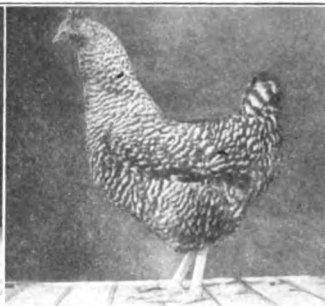
S. C. White Leghorn Cockerel



Buttercup Hen



Barred Plymouth Rock Male



Barred Plymouth Rock Hen



Silver Wyandotte Male



S. C. Black Orpington Cock



S. C. White Leghorn Hen



Black Langshan Cockerel



R. C. White Minorca Cock



Dark Brahma Hen



S. C. Black Minorca Cock

THE LEADING UTILITY BREEDS AND VARIETIES OF POULTRY—I



FIG. 290. A warbler making a meal of plant lice or aphids.

It is true that 3 of the hawks (the Cooper's,

more than a million descendants! Occasionally these mice do breed uncontrolled, and there result so-called and highly destructive "plagues of voles." It is interesting to note that these plagues are always followed by flights of owls which remain until the number of mice once more become normal.

the sharpshinned, and the goshawk) and 1 (the great horned) owl occasionally destroy poultry and small birds, but the good these flesh-eaters do far overbalances the harm, and there should never be any wholesale slaughter of them. Let the farmer protect his poultry from the harmful species (p. 251), but let him also encourage the others.



FIG. 291. The goldfinch is one of the helpful weed seed eaters.

How to Increase the Bird Population

If one wishes to increase his yield of potatoes, he must first find suitable ground, then control the weeds by cultivating, and the beetles by spraying, supply additional food by fertilizing the soil, and, if possible, water during drought. So also with birds. There should be first some woods, thickets, or shrubbery to supply cover for the shade-frequenting species, some uncultivated fields in which the open country birds may nest, and either dead trees or nesting boxes for the hole-nesting species. Secondly, there must be a supply of food, especially during the winter, and of water during drought. Then, by weeding out the enemies of birds such as stray cats, guns, slingshots, and unscrupulous boys, we will get, as with a cultivated crop an increased yield.

Supplying suitable cover. In these days of intensive farming, when the wire fence replaces the old-fashioned hedgerow and rail fence, we must, of necessity, expect fewer of the thicket-loving species of birds. And since birds will not nest in cultivated grainfields, the farm with neither thickets, clover fields, nor pasture land has to be rather barren of bird life. But there are few farms without some waste or pasture land where hawthorns and other thicket-producing shrubs might just as well be allowed to grow. The birds which frequent thickets outnumber those either of the field or of the woodland, so wherever it is practicable, thickets should be encouraged so long as they do not encroach upon arable land. Many thicket-producing bushes and vines not only supply suitable nesting places and considerable bird food in the form of fruit, but also do more than anything else to attract certain winter birds and retain some species which otherwise would migrate south.



FIG. 292. Marsh hawk, typical of the rodent-catching birds, after a meadow mouse.

Planting wild fruits for birds. A great many species, of many types, depend for their sustenance, for a part of the year at least, upon fruits. In providing for these make an effort to plant trees and shrubs with different fruiting periods, so that the supply will be more or less continuous. If nothing but mulberry trees are planted, for example, the birds will have a surfeit during June, July, and August, but may starve during September and October; if wild black or bird cherries are added, the birds are provided for until November. The Virginia creeper and wild grape hold their fruit through the entire winter, and the hackberry, sumacs, and barberry practically throughout the year, often saving the lives of many birds during the storms of early spring.

Another good reason for planting wild fruits is in order to

protect the cultivated varieties. In some places robins and waxwings do much damage to cherries, catbirds and thrushes to berries, and warblers to grapes, but in every case it is because there are no native fruits in the neighborhood to supply their need, for birds always prefer native to cultivated varieties. For shelter and nesting, birds prefer thick, scrubby bushes and trees easy of access to their feeding grounds. In nature, the best feeding grounds are about the



FIG. 293. The phoebe is one of the farmer's friends. (Farmers' Bulletin 30).

edges of forests, in clearings or along streams where nine tenths of the birds of a region are found nesting. In any woodlot or thicket nests are arranged chiefly around the edges; in fact, we might say that the amount of available nesting ground varies directly with the circumferences of such places rather than with their areas. Ideal conditions would be obtained, provided



FIG. 294. The house wren is another and a cheery neighbor, too. (Farmers' Bulletin 630).

food and water were available, by covering waste land with small groups of the proper bushes and trees, each surrounded by a little open space.

In the accompanying list of woody plants suitable for attracting birds, prepared by R. E. Halsey and Wm. L. G. Edson, of Rochester, N. Y., those unmarked bear fruit relished by birds; those indicated by stars (*) furnish also satisfactory nesting sites. The fruiting seasons, as given by W. L. McAtee, of the U. S. Biological Survey, have been added. Currants and gooseberries, which are often highly recommended as sources of bird food, should be omitted in many places because they assist in spreading the dreaded pine blister rust; in wheat-raising districts, avoid the use of barberry, which harbors the intermediate stage of wheat rust.

*Five-leaved Ivy, or Virginia Creeper. Aug.-Feb.

Boston Ivy, Sept.-Mar.

Red and Black Chokeberries. July-June.

*Spicebush. July-Nov.

*Japanese Barberry. (Berries rarely eaten when other fruits are abundant.)

*Common Barberry. July-June.

Black, or Cherry, Birch.

Yellow Birch.

Red Birch. (All the birches furnish food in fall and winter except the Red, or River Birch, the fruit of which ripens from June to September.)

White Birch.

Hackberry. Jan.-Dec.

*Dogwoods. June-Mar.

White-flowering dogwood. (Very desirable for ornament as well as for bird food.) Aug-Jan.

Cornelian Cherry.

*American Hawthorns. Oct.-April.

*English Hawthorn. Aug.-Mar.

Weigela, or Diervilla. (The seeds are freely eaten in winter by slate-colored juncos, tree sparrows, redpolls, and pine siskins.)

Oleaster, or Wild Olive. Sept.-April. Gumi.

Japanese Oleaster. (The fruit ripening in July is soon devoured by robins, catbirds, and cedar waxwings.)

Spindle Tree.

(Fruits eaten by the myrtle warbler.)

Wintergreen. Jan.-Dec.

Black Huckleberry. July-Oct.

Shrubby St. John's wort. (Small seeds always eaten in winter by slate-colored juncos, tree sparrows, and redpolls.)

*Common Juniper. Jan.-Dec.

*Irish Juniper.

*Red Cedar. (A favorite food of cedar waxwings and myrtle warblers.) Jan.-Dec.

American and European Larches.

*Common Privet. July-April.

*Bush Honeysuckles.

*Japanese Honeysuckle.

*Morrow's Honeysuckle. (Very attractive.)

*Ruprecht's Honeysuckle.

*Grapes. Aug.-June.

*Tartarian Honeysuckle. July-April.

*Matrimony Vines.

Partridge Berry. Jan.-Dec.

Mulberries. (One of the best bird foods.) May-August.

*Bayberry, or Candle-berry. (Best food to attract and hold the myrtle warblers.) July-June.

Sour Gum, or Tupelo. July-Oct.

White, Black and Japanese Spruces.

Austrian Red and White Pines. (All the pines attract crossbills and grosbeaks.)

- Mahaleb Cherry.** (Best of the wild-cherry bird foods.) June-July.
European Bird Cherry.
Wild Red, or Bird, Cherry. June-Nov.
Sand Cherry. June-Aug.
Wild Black Cherry. July-Nov.
***Flowering Crab.** (Best winter food for cedar waxwings, robins, northern flickers, pheasants, and pine and evening grosbeaks.) Sept.-June.
***Buckthorn.** Aug.-April.
Fragrant Sumac. Jan.-Dec.
Shining Sumac. Jan.-Dec.
- Smooth Sumac.** Jan.-Dec.
Staghorn Sumac. Jan.-Dec.
***Blackberries and Raspberries.** June-Oct.
***Black Elderberry.** July-Oct.
Red Elderberry. June-Aug.
Sassafras. July-Oct.
Buffalo Berry. June-Oct.
***Greenbrier.** Aug.-June.
Nightshade, or Bittersweet. July-April.
Mountain Ash. (Very ornamental in winter and berries furnish very good bird food.) July-April.

Nesting Boxes or Bird Houses

On some farms planting may not be feasible, but on every farm certain species of birds can be increased by the proper placing of nesting boxes. The name "bird house" is misleading, for the less houselike the bird box the more acceptable will it be. The fancy doll houses with compartments, chimneys, frescoes, and verandas, while occasionally used by English sparrows and martins, are usually both ineffective and out of place. The best materials for bird houses are weathered boards (*not* smoothly planed), rustic cedar, or wooden slabs with the bark on. A gourd can be made very acceptable by cutting a hole of the proper size in one side, cleaning it out and drilling a small hole in the bottom to drain off any rain that may beat in. Tin cans may be used, but should be painted or covered with bark to make them less unsightly. One end should be replaced by a block of wood and the opening made toward one edge of this or in one side of the can. Green chestnut and other bark can sometimes be secured and nailed into the form of a hollow cylinder. A hollow limb, deserted woodpecker's nest, or block of wood hollowed out to resemble one, and reinforced boxes of the right size are all good.

The box should not be so large as to waste lumber, nor too small to give room for the nest. It should never be less than $3\frac{1}{2} \times 3\frac{1}{2} \times 6$ inches, inside measurement, and it is better to make it somewhat larger, even for wrens. An average box, to attract the greatest variety of birds, would measure $5 \times 5 \times 12$ inches with the longest dimension up and down. If flickers, screech owls, or sparrow hawks are especially wanted, make boxes $6\frac{1}{2} \times 6\frac{1}{2} \times 24$ inches; if martins are desired build a house of 10 to 30 compartments, each 6 to 8 inches square. (All other houses should have but one compartment.) Rows of gourds tied to cross pieces and raised on poles will also attract martins and are extensively used in the South. Directions for building a large martin house can be obtained from Farmers' Bulletin 609, of the U. S. Department of Agriculture, entitled "Bird Houses and How to Build Them."

The size and position of the opening are much more important than the exact size of the box. A round hole is best, and, except in martin houses, it should be at one side, above the middle line, (preferably about 2 inches from the top). All hole-nesting birds, except the martin, wish to be out of sight while incubating. If there are not

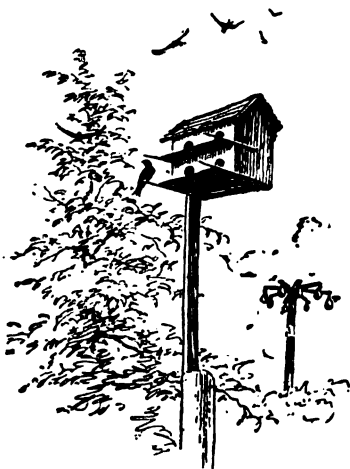


FIG. 295. A simple martin house, and in the distance a number of gourds tied to a pole to serve the same purpose.

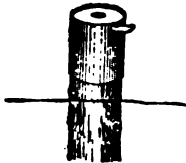


FIG. 296. Tin can bird house on top of fence post. (All figures on this page Farmers' Bulletin 609).

- a. $1\frac{1}{2}$ inch: house, Bewick's and Carolina wrens, chickadee.
- b. $1\frac{1}{2}$ inch: white-breasted nuthatch, tufted titmouse.
- c. $1\frac{1}{2}$ to $1\frac{3}{4}$ inch: bluebird, downy woodpecker, crested flycatcher, tree swallow, violet-green swallow.
- d. $1\frac{1}{2}$ to 2 inches: red-headed woodpecker, hairy woodpecker.
- e. 2 $\frac{1}{2}$ inches: flicker, saw-whet owl, purple martin.
- f. 3 inches: screech owl, sparrow hawk.
- g. $4\frac{1}{2}$ inches: barn owl, wood duck.

As a rule the entrance should be the only opening in the house. If there is any chance of rain driving in, a very small drainage hole may be made in the middle of the floor. Also a few small ventilation holes may be made well up under the eaves, but never lower than or on a level with the entrance, since draughts are always injurious.

Nesting material. Bird tenants always rent unfurnished so no nesting material in the form of straws, feathers, or sticks should be placed in the box. Place in the bottom of flicker, and other woodpecker boxes, a couple of inches of ground cork or coarse saw-dust, for the woodpeckers build no nests and must have something to keep the eggs from rolling about. A layer of saw-dust does no harm in any box, but is not necessary.

Placing the box. Quite as important as the size and position of the opening is the location of the box. If several boxes are put up, they should be at least 50 feet apart; native birds are not social and drive away other hole-nesting species from their immediate vicinity. If one

examines the natural nesting cavities of any of these birds, he will find them, with few exceptions, in the open, in bright sunlight or half shade. The best place for a box, therefore, is on a pole 8 to 12 feet from the ground in an open space, or at the edge of trees facing the open. A post on the porch or the unshaded side of the house will serve if the box is

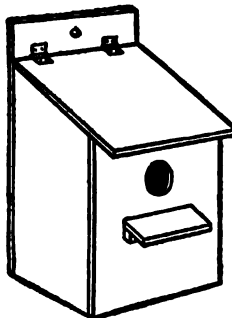


FIG. 298. Nest box that can be used by small bird friends or to trap English sparrows.

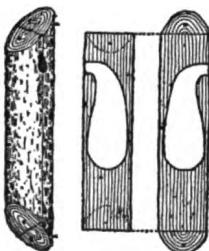


FIG. 299. Block of wood, hollowed out and joined together to make a woodpecker nesting place

examines the natural nesting cavities of any of these birds, he will find them, with few exceptions, in the open, in bright sunlight or half shade. The best place for a box, therefore, is on a pole 8 to 12 feet from the ground in an open space, or at the edge of trees facing the open. A post on the porch or the unshaded side of the house will serve if the box is

clean it in case anything happens to the old birds so that the young die. At the end of the season the old nest can be thrown out or left in without making any difference to the birds when they return the following spring. The lice which often infest wrens' nests are harmless and die soon after the young leave.

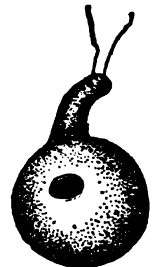


FIG. 297. Gourd cleaned out with entrance hole in side and a small drainage hole in the bottom.

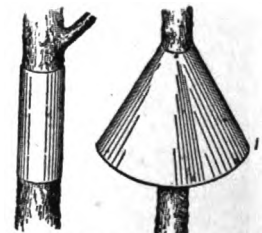


FIG. 300. Two types of tin guards to prevent cats from climbing trees or bird house supports.

Feeding the Winter Birds

Where feed is scarce there are no birds; where it is abundant they occur in large numbers. The disappearance of insects in the fall and the covering of the ground with snow undoubtedly originated the extensive, southward, winter migrations of most species, and the failure or covering of the seed supply is often the immediate cause of the departure of the few species which ordinarily spend the winter north. By supplying proper food, it is possible to attract and hold a great many birds through the winter far north of their usual range and derive the benefits of their presence in orchard and garden. Not only will they be of service as mentioned above, but they will also add to the winter landscape and to one's pleasure during the silent months, for they readily come to a feeding shelf at the window and several species become so tame that they will feed from one's hand.

What feed to use. The winter birds that may be expected to come to a feeding shelf are either seed-eaters or insect-eaters. Among the *seed-eaters* are, in the northern United States, the junco, redpoll, pine siskin, cross-bill, grosbeak, song and tree sparrows and blue jay; farther south one could expect also the white-throated and white-crowned sparrows, blackbird, and the cardinal; and, in the Western states, other species of finches and buntings. Good feeds for these are millet, hemp, buckwheat, and cracked grain of any sort, or better still mixed chick feed, sweepings from a mill, or hayseed from the barn floor. The *insect-eaters* are the woodpeckers (the downy and hairy woodpeckers very widely distributed; the flicker, red-bellied, and red-headed woodpeckers more common southward), nuthatches, chickadees, and the brown creeper. The woodpeckers drill into the chambers of wood-boring grubs; the others find insects, pupae or eggs in the bark crevices. All are very fond of beef suet, and once finding a piece fastened in a tree, will return to it again and again. Sunflower seeds and crumbs of raw peanut are relished by both insect- and seed-eating birds.

Where to place the feed. In placing the feed bear in mind that eventually you want all the birds to come to the same place, either a shelf at the window or a spot in the yard where they can be easily watched. First select the place; then, whether you build the shelf immediately or not, from it as a centre, place the feed along radiating lines to a considerable distance from the house. The more pieces of suet put up, the more quickly the birds will find them and the sooner they will come to the window sill.

At first it is necessary only to tie the pieces of suet to the branches without any protection, and the more conspicuous the places selected, the better. Later if there are many squirrels, crows, or house sparrows about, it will be more economical to move the suet to the trunk of the tree, holding it in place by a piece of wire screening ($\frac{1}{4}$ inch mesh) through which the smaller birds can peck. Another method is to suspend it from the outer

branches by strings in small homemade wire baskets, or bags of coarse mesh knitted from string. Half a cocoanut makes a good basket.

The feeding shelf. As soon as any birds are seen eating the suet, it is time to put up the feeding shelf at a window on the sheltered side of the house (usually the south), preferably the one nearest to a tree. If the window sill is broad, it will be sufficient to nail a cleat along the outer edge to keep the feed from blowing off. Usually it is more satisfactory to fasten along all or a part of its length a board, 8 to 12 inches wide, the larger the better. Fasten a narrow strip

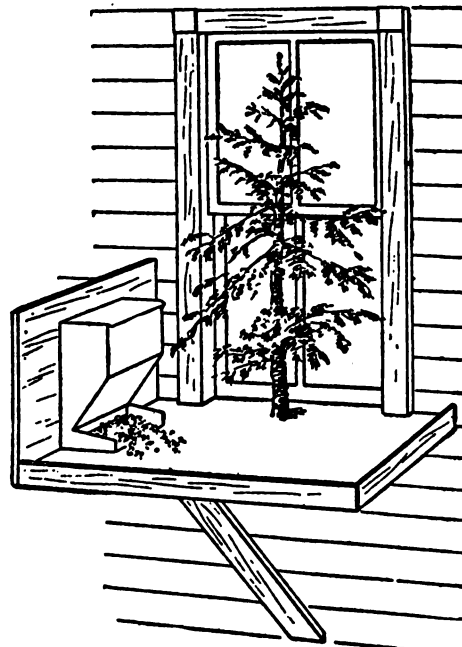


FIG. 301. One form of window feeding shelf. If supported on springs it will keep sparrows away. (Farmers' Bulletin 621)

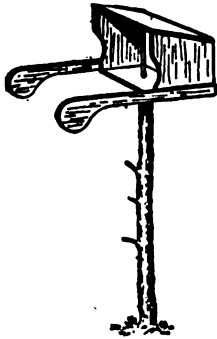


FIG. 302. Revolving, protected feeding shelf for the lawn. (Farmers' Bulletin 621)

along the outer edge to keep the feed on, and at the westerly end attach a small evergreen tree or branch to the shelf or window casing, to shelter and also attract the birds. An even better device that protects the feed from ice and snow is the window feeding box as shown in Fig. 301.

A simple, effective way to protect the food from house sparrows is to hinge the front half of the floor of the box and support it at the corners by weak springs so that when a bird alights it bounces up and down. House sparrows are naturally so suspicious that when they feel the shelf give way beneath them, they leave without stopping to get any of the feed. Native birds, on the other hand, are unsuspicious and accustomed to feeding on swaying branches; the more the shelf bounces, the better they seem to like it.

In the absence of a satisfactory window, place the box on a 4- or 5-foot post in the yard, with an evergreen tree, bit of shrub-

bery, or brush pile near by as a way station between it and the nearest trees.

Another simple feeding shelf for the yard is made from the top of a keg or from a pivoted box as in Fig. 302. Even if only sparrows come at first don't get discouraged, for they will act as decoys, and eventually call other more desirable birds to the feast.

Bird baths. Nearly as important as feed is water, both for drinking and bathing. Perhaps the most attractive pools for attracting and retaining birds are in the form of rockeries with ferns and wild flowers planted about them. A concrete basin can either be sunk in the ground or raised on a pedestal, provided there are no lurking places close by where cats can lie in wait to spring upon the birds while they are helpless with soaking feathers. Other bird fountains consist of large pottery saucers raised above the reach of cats, or, simpler and less attractive but just as effective, shallow pans or trays sunk in the ground or placed on a window shelf, etc. In any type (a) the bottom and sides should be rough so that the birds will not slip upon entering the water, for if they do they will never return; (b) the water should not be more than half an inch deep where the birds are expected to enter; and (c) the water should be renewed as it evaporates or becomes stale. If possible connect the pool with the water pipe, the drain from the ice-box, or some other constant supply.

Enemies of Birds

Every increase in bird life sees a corresponding increase in its enemies which, if unchecked, render all efforts toward attracting the birds of no avail. The greatest scourge, yet the most easily controlled, is the domestic cat, which probably kills more birds in the United States than all other enemies put together. This is due partly to the large number of stray cats which, having been turned loose or having wandered away, are now living wholly by hunting, and are producing a strain of half-wild mongrels that are becoming alarmingly abundant in eastern United States. Whoever keeps a cat should assume all the care and responsibility it involves. If instead of starving cats "to make them better mousers," and turning them outdoors at night, every one would lock their cats in the cellar or barn at night and feed them in the morning before turning them loose, the cat problem would be solved. No one would keep worthless cats; stray hunters would be identified and exterminated; and the country would soon be enriched by the saving of thousands, even millions of birds.

Other animal bird enemies include the lynx, fox, raccoon, mink, weasel, and

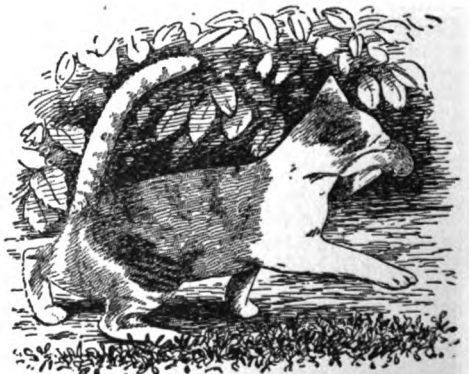


FIG. 303. Homeless cats—and sometimes pet ones—are the birds' worst enemies



FIG. 304. Small boys and air guns are serious destroyers of song birds, but more through ignorance probably than cruelty.

ket and directions for making them at home can be found in Farmers' Bulletin 493. Sparrows may also be baited where they can be shot from a window or other concealment, this being better than poisoning, because native birds often find the poisoned grain.

Where many roost together, as on ivy-covered walls, large numbers can be taken in a cheesecloth net about 20 feet square. This is raised into place against the wall after the sparrows have gone to roost, and when lowered scrapes them off their perches by the hundred. Sparrows so caught or trapped can be killed by dislocating their necks and used like any small game bird in making very acceptable stews or pot pies.

The starling, introduced into New York City in 1891, is now multiplying and spreading nearly as rapidly as the sparrow through New England, New Jersey, New York, eastern Pennsylvania, and even Ohio. The economic status of this bird is still undecided; it is much more of an insect eater than the house sparrow, but it is very quarrelsome and, nesting in holes in trees, is rapidly driving out bluebirds, flickers, etc.

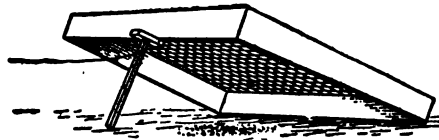


FIG. 305. Sieve trap for catching English sparrows. (Farmers' Bulletin 383)

Bird Foes on the Farm

These fall into three classes, viz., poultry thieves, grain thieves, and fruit thieves. Most of these have developed appetites for particular crops and are harmful for only short periods when they should be fought and driven away but *not* exterminated. However, a few have come to depend so largely upon the products of the farm at all seasons that their presence is a serious menace, and every effort should be made to exterminate them. These are the Cooper's hawk, the sharp-shinned hawk, the goshawk, the great horned owl, and the English or house sparrow. These hawks feed almost entirely upon poultry and small birds, and this owl regularly visits the chicken yard and carries off full grown hens or may even nip the heads from turkeys roosting in the trees. On the other hand all do some good, especially the owl, in destroying rats, weasels, and rabbits.

How to know these enemies. The color markings of the different hawks and owls are so similar and vary so much with age that it is impossible to give simple color descriptions for distinguishing them. The destructive hawks differ from the beneficial species in having short, rounded wings and long, narrow tails. They frequent thickets, fly low, perch near the centre of trees and keep well out of sight, while useful species always circle high over head or perch on dead trees or exposed branches. The goshawk is one of the largest of hawks, nesting rather far north or in mountainous regions and coming south only in winter. The Cooper's hawk (chicken hawk), is found throughout the country at all seasons, as is also the smaller sharp-shinned hawk, but both move southward somewhat and are less common in the North in winter. They are similar in color, brown above and streaked below, when young; gray above and barred below when adult.

The great horned owl is the largest of the owls, seemingly twice the size of a crow, with conspicuous tufts of feathers or "horns" and a large white patch on its throat. It should not be confused with the much smaller, long-eared owl, an extremely beneficial bird with striking ear tufts, about the size of a crow, which feeds entirely on mice and frequents evergreen thickets during the day.

Defensive measures. There are two ways of dealing with these birds: the shot-gun which is the more satisfactory when the birds are nesting (from May to July for the hawks, and during March and April for the great horned owls); and traps, which are most useful about the poultry yard. The hawks are very noisy about their nesting ground, making the nest easy to find; if the old birds are shot here, the young should also be destroyed. Place traps on the top of high posts where the birds may alight, adjusting them so that smaller birds will not spring them and padding the jaws so that if the wrong bird is captured it can be released. If a fowl has been killed by one of these birds but not carried off, fasten it immediately to the post below the trap because the hawk or owl will return for it.

Grain thieves. Damage to grain is done either in early spring or in the fall. Crows and blackbirds visit plowed fields in search of grubs, wire worms, etc., and have been known to pull up sprouting grain and eat the kernel. On the whole they are much more beneficial than destructive so that fighting them away is better than killing them. Corn may be coated with creosote, tar, or crude oil to make it offensive without hurting its germinating qualities. The objection is that

it will not sow well with a drill. Some farmers sow the treated corn by hand about the edges of the field where the birds are most likely to work, and drill the rest. Others scatter the oiled kernels on the surface, and some prefer to bait the crows with good corn to some other part of the field. A second protective method is the use of scare-crows. Strings stretched across the field with dangling bits of bright paper or tin, a dead crow hung on a stick, or the old-fashioned human figure are always effective for a short time—until the crows become accustomed to them. They



FIG. 306. The great horned owl looks the destructive farm enemy that he is.



FIG. 307. The Cooper's or chicken hawk is one of the best known of poultry enemies

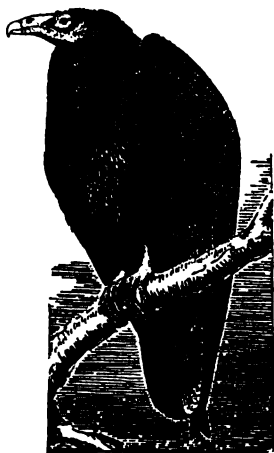


FIG. 308. The turkey buzzard is a great scavenger, but he may also spread animal diseases from farm to farm. His real worth has not yet been established. (Farmers' Bulletin 755).

should be moved or changed about, therefore, every few days, until the corn gets well started.

When grain is mature, and even after it is stacked, huge flocks of blackbirds and sparrows frequently consume a valuable portion. No satisfactory way of dealing with them has been found except that of scaring them away with a gun. In most cases the cost of the ammunition is greater than the damage done unless the flocks are of great size.

Fruit thieves. The most difficult problem of all concerns the fruit thieves because they include some of our most beautiful and beneficial birds like the robin and the waxwing. Cherries, strawberries, and grapes suffer the most but it would be poor policy to kill the birds when they are so useful at other times. Sometimes, for immediate relief, shooting has to be resorted to, but blank cartridges scare them away quite as well as more deadly ones. The best protection is given by planting native fruits (p. 244) near the cultivated varieties, for it is the absence of a natural food supply that drives birds to the cultivated crops. Among the most useful are mulberry, wild blackberry, strawberry, service-

berry, wild cherry, and elderberry.

Birds as Pets

BY D. E. LANTZ (See Chapter 16)

It is rarely if ever desirable to keep our native song birds in captivity; they are far more interesting in the wild state and will often become remarkably tame if fed regularly and not scared or ill treated. As in the case of wild animals, a slightly injured specimen if taken home, cared for and then released, will often linger about, wait to be fed, and serve many of the purposes of a pet without demanding the same care and expense. Of the wild birds the grain-eating sorts are the easiest to keep in good condition, but where conditions are favorable, cranes, herons, quail, grouse, wild ducks, and geese, crows, magpies, jays, and small hawks and owls, sometimes develop into interesting pets. In all cases give as much freedom as possible. Some state laws forbid keeping certain wild birds in captivity.

Tame birds. These include ordinary poultry, pea fowl, and guinea chickens, pigeons, parrots, canaries and other foreign cage birds. Birds bought in cages should never be set free as they are unable to shift for themselves in Northern sections. The details of keeping common poultry are given in Chapter 18. The care of caged birds varies with the species and complete information should always be obtained from dealers or other practical authorities before attempting to raise them. In the case of a canary, be sure and get a good singer. Protect the bird from draughts, darken the cage at night, keep it clean at all times, renew food and water frequently and let the bird bathe several times a week. Farmers' Bulletin 770 of the U. S. Department Agriculture discusses canary raising in detail.

CHAPTER 25

The Cultivation of Game Birds

By HERBERT K. JOB, student and lover of birds, and Economic Entomologist of the National Association of Audubon Societies. Any one desiring advanced information on this subject is referred to his book, "*The Propagation of Wild Birds*,"* now the recognized standard text; and to the "*Department of Applied Ornithology*" of the Association of Audubon Societies, at 1974 Broadway, New York City, of which Mr. Job is in charge.—EDITOR.

EVERY intelligent agriculturist should and must feel an interest in the preservation and increase of wild bird life in general, but especially on his own land. The importance of insect and seed eating birds is emphasized in Chapter 24. These pages deal with the increase and use of certain birds as game—a subject that of late has attained great importance. Such species, properly conserved, may be made the source of a considerable food supply for farm use, or of financial profit when cultivated for market, either as breeding stock or to give to land increased rental value for legitimate hunting privileges.

What Bird Propagation Means

Game birds that can be cultivated fall into two general groups—*upland game* species, such as various pheasants and quails, the ruffed grouse or partridge, the prairie chicken and the wild turkey; and various *water-fowl* species, particularly various kinds of ducks and geese. There are two lines of possible effort or cultural methods, namely, *natural* and *artificial* propagation.

Natural propagation consists in making the natural surroundings so safe and attractive that the native resident game species will increase in abundance strictly in the wild state. This method excludes the idea of raising game-birds for market or sale as breeding stock, as the laws in most states make wild game state property and forbid its sale. The most that can be made out of it financially is to provide meat for the table, to furnish the farmer with better shooting, or to enable him to lease the land to others for hunting purposes. Actual operations



FIG. 309. The wild turkey in its native haunts. (Courtesy Hercules Powder Co.)

*Doubleday, Page & Co., Garden City, N. Y., \$2.00 net.



FIG. 310. (Courtesy Hercules Powder Co.)

fresh water with a slight current; pondweeds, banana waterlily, musk grasses, waterweed, and coontail for fresh water usually still; and wild millet for the edges of fresh water where marsh conditions are wanting. These will usually attract many birds during their migrations and induce some to remain and nest if the locality is suitable.

Artificial propagation of game birds is quite another matter, requiring a definite outlay of time and labor and some expense. In this case, however, the birds are actually owned as private property. Formerly it was illegal to hold game birds alive in possession, but a nation-wide movement has arisen to encourage game propagation, and many states have passed laws permitting this, with varying regulations as to details. Some specify that only certain species (pheasants and mallard ducks) may be held, fearing frauds and abuses with native game; others are liberal and progressive and are doing all they can to encourage game propagation. The outlook is excellent, and every year becomes better. Farmers should consult their local commissioners of fisheries and game, learn what can legally be done, and try to secure coöperation from the department. In cases where laws and regulations are oppressive, they should take up the matter in their local and state granges, and secure better laws.



FIG. 311. The ring-necked pheasant is the best of the game birds to begin with

involved in this method may be grouped as (a) *providing protection from enemies* and (b) *increasing the food supply*. Wild flesh-eating enemies, such as the fox, weasel, skunk, raccoon, Cooper's hawk, great horned owl, and notably the roaming house-cat, represent probably the greatest hindrance to the increase of game. Trapping will produce a revenue from fur bearers and also greatly help game and other useful birds. Excessive shooting must be stopped. The food supply is also a most important factor. An excellent plan for helping tide game over severe winters is to plant patches of small grain in unused corners of fields or open spaces in wood- or brush-land, and let them stand. Another is to make simple shelters of old boards or evergreen branches in the woods or edges of fields where game is naturally found, and keep under these a little scratch-feed, or even piles of barn sweepings. In shallow ponds and marshy areas start water-plants like eel-grass for salt water; widgeon grass, sago pond weed and wild celery for brackish water; wild rice, wild celery, pondweeds, and watercress for

What Birds to Raise

What kinds of game birds are practicable for propagation on an average farm? I should say, under our present state of knowledge, pheasants, quail, and the wild turkey. Pheasants have been bred in captivity for many generations, and can stand confinement better than quail, although neither can be cooped up like chickens without starting epidemic diseases. A few years ago it was thought impracticable to breed quail at all, but it has since been demonstrated that it can be done quite easily if proper precautions are taken.

My advice is to begin with a few ring-necked pheasants, the hardiest and easiest species to work with. When the details of the work have been learned, then try fancy pheasants or quail. The common partridge or ruffed grouse is not good material for the beginner, owing to the fighting tendencies of the male and the need of large enclosures. The gray or Hungarian partridge is also peculiar and its cultivation requires a large enclosure and expensive layout. Pheasant rearing, however, is entirely practicable and quite profitable. The birds are small eaters and bring good prices. Any bright farm boy can raise them on a small scale and reasonably expect good returns.

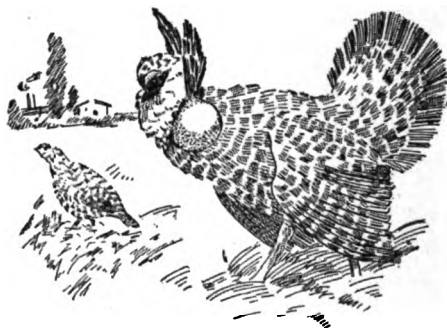


FIG. 312. A prairie chicken cock strutting with tail spread and air sacs expanded. The bird in the distance shows how he usually looks.

Beginning with Pheasants

Here is a brief sketch of a plan for beginners. Buy ring-necked pheasants in breeding units of one cock and 3 to 5 hens and keep each unit in a separate wire enclosure, not less than 12 x 16 feet in extent. Clip a wing of each bird so it will not hurt itself by attempting to fly. It is best to make the enclosure portable so it can be dragged to fresh spots of ground. Board the sides 2 feet up to prevent the birds seeing out; cover with ordinary chicken wire above and on the sides to keep out hawks and cats. Have piles of brush in the yard, under which the hens will lay, and a board shelter on one side, to protect them from sun and storm.

Feeding. The feed for adult pheasants is mainly a mixture of small grains, such as ordinary scratch-feed. Some animal food is essential to prevent the birds contracting vices of egg-eating and feather-plucking. Use a good, clean grade of dried meat-scrap, but in carefully limited quantities, as too much upsets the digestion. One plan is to give, scalded, all the birds will eat, twice a week; or it can be kept before them dry, in which case they eat only limited amounts. Some green feed also is necessary. Grass and clover growing in the pens will answer while it lasts, then give any available succulent vegetation, or, in winter, such things as cabbage, kale, beet or other tops, chopped vegetables or apples. Feed twice a day only what they will eat up clean, and keep grit, ground charcoal, oyster-shell, and fresh water before them.

Provide a forcing mash to stimulate laying as the morning feed from the latter part of March through the laying season, to July. The receipt used by Harry T. Rogers, of the New York State Game Farm is: one-third, shredded alfalfa scalded separately for about half an hour; two-thirds, a mixture of equal parts of ground corn, ground oats, middlings and bran, scalded (in scalding make only crumbly moist, never sloppy); mix the two, then add 1 part to 12 of dry bone meal.

Hatching and brooding. Laying usually begins during April. Collect the eggs each day, or the birds may learn to eat them. Hatch them under light-weight hens, the period of incubation being about 24 days. Pheasant eggs for hatching may also be purchased from game farms. For the first 4 or 5 days until they learn the hen's call the

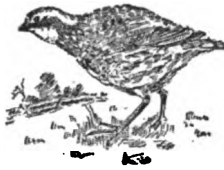


FIG. 313. A quail or "bob-white"

young should be confined with her in a coop and small yard of boards or fine wire. Then the yard may be removed, and the young allowed to run out in the grass to hunt insects; the hen may at times be allowed to range with the young, if the surroundings are safe. The coop should have no bottom and must be frequently moved to a fresh spot.

Care of the young. The young are fed 5 times a day the first week, 4 times the second week, and even the third, according to how much natural food they are able to get, and then 3 times daily until they are about 2 months old, when morning and night is sufficient. In keeping wild game birds, both old and young, it is supremely important not to over-feed, but to give only what they will eat up clean at the time. Begin by giving the day-old chicks a little hard-boiled egg mixed

with crumbs of cracker or parched bread. After a week begin to feed a mash of fine-ground "pheasant-meal," which is a balanced ration, including meat-scrap, sold by game-dealers. Add this, scalded and crumbly moist to the egg, then begin to reduce the latter gradually, omitting it entirely after the birds are 4 or 5 weeks old. When about a week old the chicks should begin to learn to eat hard seed when an occasional feed of chick grain mixture may be given alone or mixed with the mash if they do not take to it. Cracked grains when moistened, however, quickly sour, so it is better to teach seed eating by mixing canary seed with the mash. Increase the grain ration, until when they are about 2 months old a scratch-grain mixture becomes the principal feed. The young require grit, charcoal, and water and must be allowed to run free till quite well feathered. They come regularly for meals while small, but begin to stray off when nearly grown up. At this point they should be enticed with feed into a wire pen, and kept in good-sized grassy yards, each bird with a wing clipped.

Quail Rearing

The bob-white, or common quail, is handled in much the same way, except that, as a rule, the birds mate and must be separated into pairs. Any male and female will mate. Breeding stock is usually bought from dealers in late fall and winter, and kept in wire pens, a good size being 30 x 40 feet for a flock of 24. The ground should be fresh and clean, preferably turf, and *never where poultry have been kept*. A little board shelter, with straw and brush to hide in, is all the protection required. In spring the couples are put each into a small movable wire coop, at least 4 x 8 feet, in grass, with brush shelter. They are late breeders, but usually lay abundantly from the last of May till late summer. Collect eggs once a week or oftener. Quail, like pheasants, seldom incubate their own eggs. They are very fragile, so bantams are used to hatch them and rear the young. The incubation period is 23 days; feeding and rearing are about the same as with pheasants.

Other quail and grouse. Several other quail are fully as easy to propagate as the bob-white, notably the California or valley quail, the Gambel's quail, and the scaled quail. Being Southwestern species, they, naturally do best in the warmer parts of the country, though they can be bred and raised in the Northern states if given shelter during severe stormy weather; mere cold does not bother them. These species do not require special pairing, but produce eggs well when kept together in a good-sized enclosure, with grass and brush.

The ruffed grouse, or partridge can be raised but hardly by the average farmer. The males are bad tempered and, except in winter, must be kept in separate pens. Furthermore, this species cannot bear close confinement; each cock and his several hens must have a separate, large enclosure, which

is expensive. The prairie chicken belongs to the grouse family, and experiments in rearing it have only recently begun.

Wild game never should be confined on the same ground where poultry have been kept, nor on the same land for 2 consecutive seasons.

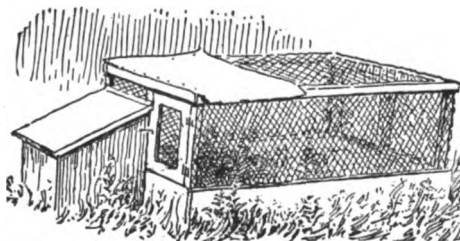


FIG. 314. A quail breeding pen that any farmer can make

The wild turkey is a fine game bird, and can readily be bred artificially. Breeding units of one gobbler and up to half a dozen hens should be kept in a good-sized wire enclosure at the edge of a wooded and brushy tract. The eggs are hatched under ordinary hens, and the young allowed to roam with these foster mothers. Thus reared, they grow up quite tame. Wild turkeys, like tame ones, are sensitive to wet and subject to the same fatal epidemics and their management is much the same. (See Chapter 21). Many persons think they have wild turkey stock, when this is not the case. The genuine Eastern wild turkey always has a dark brown tip to its tail, instead of the white or buffy tip of the domestic or mongrel turkey; also it never has white or buffy edgings to the feathers of the upper part of the rump above the tail.

Rearing Wild Water Fowl

Another interesting and practical line for the farm is the raising of wild ducks and geese. This is not only a pleasure in itself, but also can be made profitable, particularly on a medium scale, where the birds can secure some natural food.

The ideal conditions are a small, marshy pond, surrounded by some swamp and open land thickly overgrown with grass and weeds. Such a body of water may be secured by damming up a brook and need not be large; in fact, a mere pool will answer for a few ducks. An ideal size would be an acre or two of water and as much more swamp and grass land, the whole to be enclosed by a wire fence 7 feet high if possible, though less will answer if enemies can be kept under control.

The lower 2 feet should be of 1-inch mesh wire, the rest of 2-inch.

Wild ducks, in order to breed well, require privacy, especially thick places where they can hide their nests. If the enclosure is free from large fish and frogs, turtles, and pillaging animals, and especially if time to look after them is scarce, the ducks may raise their own young. The safest and most successful method is to collect the eggs and hatch them and rear the young with hens on dry land, not letting the young out on the pond until well grown.



FIG. 315. Ideal conditions for wild duck and goose raising



FIG. 316. A pair of mallard ducks, the male in the foreground

The mallard duck is by far the easiest species to produce in large numbers, as it lays abundantly. The ducks are of good size, well flavored, and handsome. Commercial duck farms already raise them by thousands, especially near the coast, where cheap sea-foods can be secured to help out the grain bill. Ducks are hearty eaters, and there is some question whether it is profitable to raise large numbers where they must be fed entirely on purchased foods; but many a farm can easily and profitably rear a moderate flock of mallards for market where there is plenty of natural feeding ground for them to range over. In securing mallard stock it is important to get a pure strain, birds true to original type, and able to fly well—not the heavy, degenerate “puddle ducks.” Real mallards can be



FIG. 317. Mr. Job's plan for wintering ducks. Inside the house the water rarely, if ever, freezes

allowed to grow up with wings untrimmed, and let fly, certainly until the hunting season. They remain fairly tame, come back for food, and may be enticed into a wire enclosure when wanted. Such full-winged stock can also be sold to game preserves and estates where ducks are desired for sporting purposes.

Other wild ducks. In quite a different class is the cultivation of other, higher-priced species of wild ducks for sale as breeding-stock only. The breeding of the beautiful wood duck is practicable, interesting, and profitable as stock brings very high prices, but there are some technical points about the handling of this species which the farmer should read up on before starting in.

Other wild American species, including the pintail, black duck, widgeon or baldpate, gadwall or gray duck, shoveller or spoonbill, green-winged teal, redhead, canvasback, the scaup ducks, and the ring-necked duck are well worth experimenting with. Stock

of most of these can be secured from dealers, though the canvasback is hard to obtain. Although these species have not yet been reduced to semi-domesticity so as to breed freely and abundantly like the mallard, there is, nevertheless, great demand for them as breeding-stock all over the country. The following seems to be the solution of the problem: The original wild-caught ducks are shy and reluctant to breed, but they can often be made to lay one litter a year under the right conditions in a swampy enclosure. The young grow up accustomed to captivity and breed much more freely. A few generations in captivity will doubtless produce a race that will reproduce easily and abundantly. Those who first accomplish this will reap the largest profits.



FIG. 318. The Heywood method of wintering wild ducks

Wintering ducks. The wintering of ducks is another problem. Most of the above species can live outdoors the year around, even in rather cold latitudes, especially where there is running water, where with a little assistance they can keep open a hole in the ice by constant swimming, and where there is a simple shed into which they can be driven and shut up during severe spells when they might get frozen in the ice.

An ideal plan which I have adopted is to build a simple little house of plain materials out in shallow water which flows under and fills it to a certain level. For a couple of hundred ducks I have one 24 x 16 feet, but half that size would do for a small number. Four ordinary frame windows are set in the front (facing south), and one in the west side. Two-thirds of the inside area is swimming pool, the rest being a platform just out of water, either stationary or floated on



FIG. 319. Wild goose on her nest

casks, according to whether the level of the water varies or not. On this the ducks dry themselves and feed. The water enclosed does not freeze, even in zero weather, and even the more tender species winter finely and are in good condition to breed in the spring.

Wild geese. Canada geese are hardy, and can live outdoors by the pond all winter. They are docile, with some peculiarities, and normally will rear one brood of young each season, when 3 years old and mated to their liking.

Guinea Fowl

By F. H. VALENTINE (See Chapter 20)

Although the guinea fowl is more or less a farm bird and generally classed with poultry, it seems incapable of thorough domestication and remains half wild even when confined. Thus it seems best to discuss it here rather than with domestic fowl. Being of a roving disposition, thriving best when not restrained, it is better suited to the general farm where it can roam at will than to the restricted poultry plant. It may steal some grain and perhaps damage berries, tomatoes, and green crops in the garden if not prevented; but it will also destroy many insects and consume many weed seeds. Both old and young will thus obtain the greater part of their living by foraging, benefiting rather than injuring the farm crops.

Very few farmers have made a specialty of raising guineas; the majority let them raise themselves and have little or no idea whether they represent profit or loss. In reality as a side line in combination with crops to which they do little damage, and where a market for them exists or can be developed, guineas should prove a valuable feature. The bird is fine eating. It is in great demand in city hotels and clubs, but less so in private or general retail trade. Broilers weighing half a pound to a pound are popular, but so, also, are fully grown birds. The meat is dark and the birds are often served as game; prices, therefore, are high as a rule.

The guinea hen's habit of hiding its nest and of sharing it with other guineas until a large number of eggs have accumulated, make egg production a less satisfactory enterprise. The eggs are about half the size of hen's eggs, very pointed and with dark colored, very hard shells. They are better for use in cooking than for eating alone, though very palatable when fresh.

The undesirable qualities of guineas are (a) their shrill, harsh cries uttered frequently at all hours; (b) their quarrelsome dispositions which make them objectionable among other poultry, especially young ones; and (c) their roving natures.

How to raise them. Guinea eggs hatch in from 26 to 30 days; common hens or incubators may be used. It is well to hatch the first settings of eggs—if they can be found—under hens, letting the guineas hatch any laid thereafter. The chicks or "keets" are very lively even when newly hatched and if to be confined must be kept in covered runs made of fine-meshed, wire netting. They need feed as soon as hatched and more often thereafter than chicks. At this state they are liable to injury by dampness and should be pro-

tected. In warm weather, unless storms occur frequently, they do well running at large. When confined they should be fed about the same as chickens—a variety of fine grains, greens, grit, and fresh water making a good ration. Some suggest the use at first of bread soaked in milk, soaked grains such as millet, chopped boiled eggs, oatmeal, canary seed, and onions. As guineas are great insect eaters they should receive plenty of animal food (meat scrap, bone, etc.) when confined.

Both old and fairly young birds prefer trees for roosts so the cost of housing guineas is slight. Any cheap shed for use in bad weather is ample. Some growers who have had fair

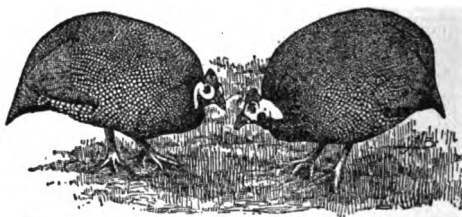


FIG. 320. A pair of guinea fowl. This is the common pearl variety. There are also white and lavender sorts, the latter closely resembling the pearl variety. (Farmers' Bulletin 234).

success in domesticating guineas put high roosts and well hidden nests under open sheds and by feeding them regularly close by induce them to roost and lay in the sheds. If a hidden nest is discovered and all the eggs are taken the nest will be abandoned; but if care is taken not to disturb the nest and to leave some eggs in it, the guinea hens will usually continue to lay in it.

Guineas need little fattening for market. As a rule the breast meat is heavy, the proportion of offal small and the flavor of the flesh, if well cooked, excellent. The birds are killed by sticking in the mouth like fowl, and are marketed undrawn and unplucked, or with only the breast feathers removed.

It is probably best to start by buying a setting of eggs since old birds are likely to leave a new home and fly back to the farm from which they were bought. They seem to consider the place where they were hatched as home. It is hard to tell male and female apart. The birds sometimes mate in pairs and sometimes at the rate of 3 or more hens to a cock. But it is rarely necessary for the farmer who raises a few to concern himself over this.



Light Brahma Male



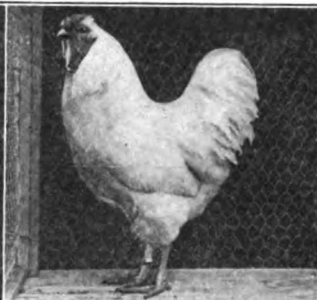
Silver Gray Dorking Male



Partridge Cochin Hen



Columbian Plymouth Rock



White Wyandotte Male



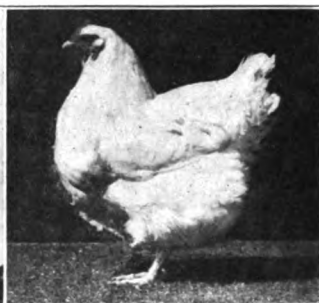
Silver Wyandotte Female



Buff Orpington Pullet



Ancona Cockerel



White Orpington Hen



White Plymouth Rock Cock

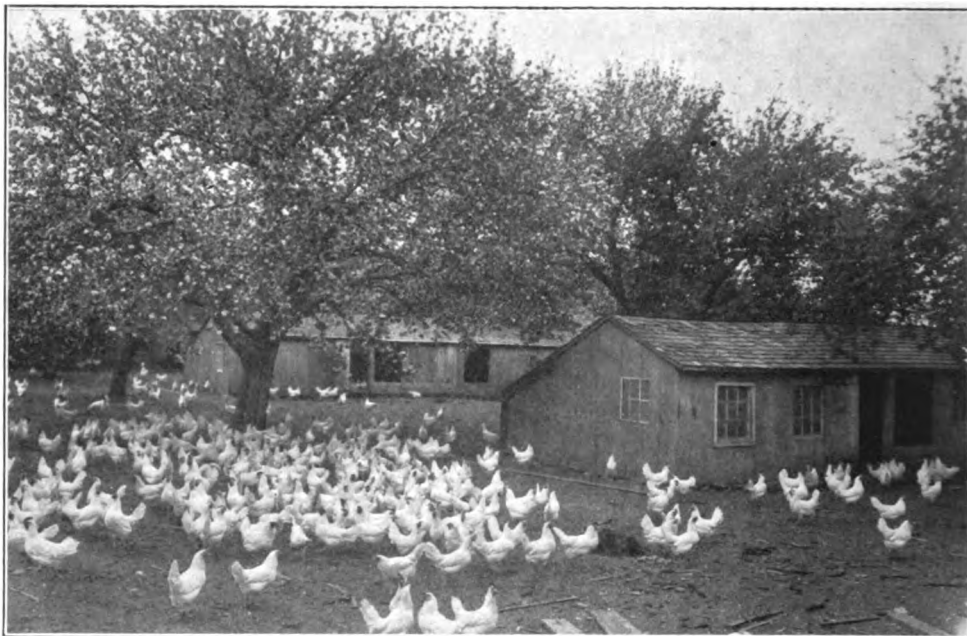


Houdan Hen

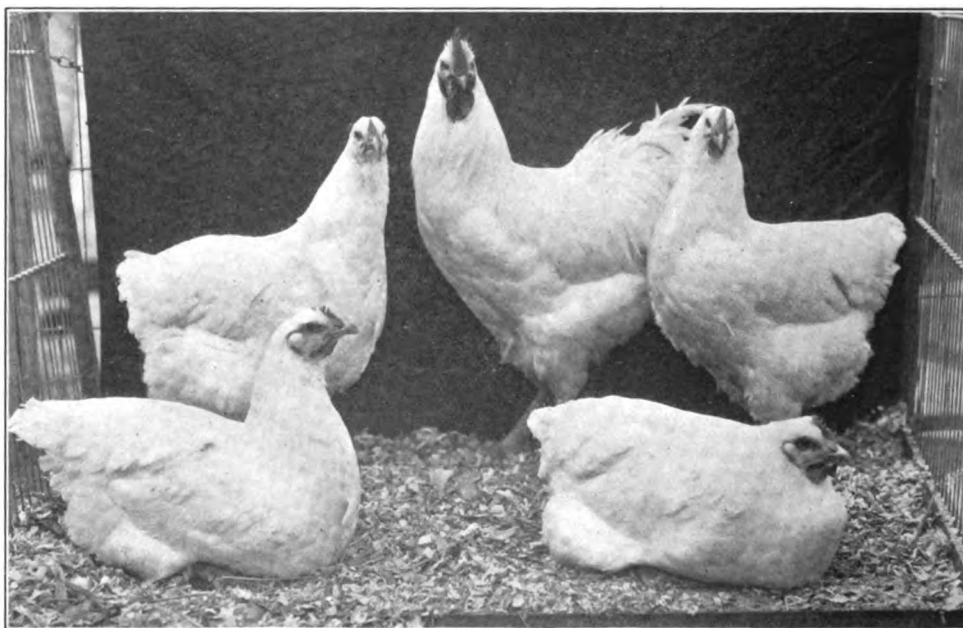


R. C. Rhode Island Red

THE LEADING UTILITY BREEDS AND VARIETIES OF POULTRY—II



As a source of eggs and meat the fowl deserves a place on every farm. These are ideal surroundings for the farm flock



As breeding stock and show material it offers opportunities that the man with skill and knowledge can grasp. A prize-winning pen of White Plymouth Rocks

POULTRY RAISING MAY BE INTERESTING AND PROFITABLE ALONG TWO LINES



FARM KNOWLEDGE

PART II



Farm Animals: Their Care in Sickness

Up to this point, this volume has discussed the care of healthy farm animals, that is, the details of livestock management under normal conditions. The next 14 chapters deal with these same animals in the light of the troubles that may attack them, and with the problem of recognizing and treating these troubles. The chapters of Part II are in turn grouped in two divisions: Section 1, dealing with the common, less serious diseases of horses, cattle, sheep, swine, poultry and dogs; and Section 2, covering in rather greater detail those infectious diseases that are likely to spread through large numbers of animals and threaten the livestock industries of counties, states, or even the entire nation.—EDITOR.

SECTION ONE—COMMON DISEASES

EVERY farmer must expect, sooner or later, to have a sick animal on his hands. Much trouble can be prevented by careful management, but diseases, like accidents, *will* happen, and the best assurance of successful treatment is preparedness. This means having, first, the ability to discover and recognize the ailment as soon after it starts as possible; and, second, the knowledge, ability, and equipment required for the treatment of the animal. The chapters in this section have been written expressly to give the farmer this sort of preparedness.

In discussing the common diseases of each kind of stock, there is given, first, a short description of the animal body and how it works when well. Only by knowing how the normal animal looks and acts can we recognize abnormal conditions. Then follows a table or key of symptoms by means of which to tell what is the matter with the animal in question with directions for its use.

If, even with the key, you are seriously in doubt, or if the sick animal is of exceptional value, the wisest course is to send for a veterinarian—whose sole business is to know about such things. The aim of this part of Farm Knowledge is to make this step unnecessary in simple cases, and even in other instances to enable the farmer to give the “first aid” treatment that is so often invaluable when expert help cannot be had at once.

The modern treatment of disease in animals as in man, is based on knowledge, the relation of causes and effects, prevention (even more important than cure), cleanliness, and sanitation. Certain simple, home prepared remedies are often useful and effective; but superstition and blind guesswork have no place on the farm of to-day. The following chapters describe the methods and materials that must take their place.

CHAPTER 26

Common Diseases of the Horse

By DR. A. S. ALEXANDER, professor of Veterinary Science, University of Wisconsin and Director Division of Horse Breeding, whose knowledge of this subject and of how to treat it is of a long, varied, and intensely practical experience. His training has included the fields of the veterinarian, the estate manager, the farmer, and the stock breeder. He has farmed in Scotland, Illinois, and Iowa, and at present is breeding high-class cattle, horses, swine and poultry on his farm in Wisconsin. In addition to extensive veterinary practice, he has held various executive offices in connection with live-stock affairs, has had considerable editorial experience, and has become widely known as a teacher, lecturer, and writer on broad agricultural subjects as well as technical ones. His discussions of horse, cattle, sheep, and swine diseases as given in these pages, have been especially prepared for practical use, from a practical viewpoint and along safe lines of practical usefulness.—EDITOR.

THE HORSE'S BODY

(By the Editor)

IN THE larger details this description will apply also to cattle, sheep, and swine; differences in the structure or action of these animals will be noted in the chapters that deal with them. In many cases the names of parts, the normal condition of the body, etc., will also be the same for the different groups.

The animal body is made up of 7 systems or groups of organs, each with its own line of work: (1) The skeleton or bony system supports the body and gives it strength and general shape. (2) The muscular system produces the motion of the body and its parts. (3) The digestive or alimentary system consumes the food and provides materials with which tissues (bones, muscles, nerves, etc.) are built up, or rebuilt when destroyed by age, use, or injury. (4) The circulatory or blood system carries these materials through the body and gathers up wastes and impurities. (5) The respiratory or breathing system purifies the blood and supplies it with vital materials from the air. (6) The urogenital system includes machinery that removes certain waste products and also the organs concerned in the reproduction of the animal. (7) The nervous system controls the action of the body and its parts and receives the impressions that come from the outside.

1. The skeleton of the horse consists of about 250 bones of various shapes and sizes, some fixed tightly together as in the skull; others held together but with some play, as in the backbone; and others hinged together at joints that permit fairly free motion in at least two directions. Bones are enclosed in a thin, tough skin (*periosteum*) except at joints where this is replaced by smooth, slippery *cartilage*. Joints are bound together by strong fibrous *ligaments* and the movable bones are fastened to the muscles that move them by non-stretching *tendons*. Each joint is greased from a sac attached to it, in which is made and stored up joint oil (*synovia*). The bony

system is the seat of nearly all cases of lameness, deformity and unsoundness; injuries to it can also affect both the muscle and the nerve tissues by bruising or cutting them. The farmer should learn to know the appearance of both sound and unsound bones and joints as well as the ways in which the commoner defects develop and can be corrected.

2. The muscular system making up the lean meat or flesh, includes (a) voluntary muscles which are under the control of the will; and (b) involuntary muscles such as those of the heart and stomach which keep on working whether the animal wills it or not. Muscles act by *flexing* or contracting, that is,

becoming shorter, thicker, and harder. In doing this they produce heat and do work, represented by lifting, moving forward, pushing downward, striking out, etc. Where they work over and around bony enlargements muscles, like joints, are oiled with a fluid supplied from small sacs called *bursae*.

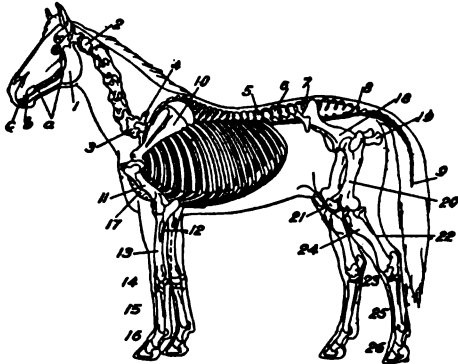


FIG. 321. The horse's skeleton. *a* molar teeth; *b* tusks; *c* nippers. 1 jaw bone; 2 atlas bone; 3 last vertebra of neck; 4 and 5 first and last vertebrae of chest section of backbone; 6 and 7 first and last vertebrae of lumbar section; 8 and 9 first and last tail vertebrae; 10 shoulder blade (*scapula*); 11 arm bone (*humerus*); 12 and 13 bones of forearm (*ulna* and *radius*); 14 knee (*carpus*); 15 cannon (*metacarpus*); 16 and 26 toes; 17 breast bone (*sternum*); 18 and 19 parts of pelvis (*ilium* and *ischium*); 20 thigh (*femur*); 21 knee cap (*patella*); 22 and 24 leg bones (*tibia* and *fibula*); 23 hock (*tarsus*); 25 metatarsus.

Voluntary muscles act as a result of stimulating, which is usually the result of a message carried by the nerves. Fat, whether mixed in with muscle tissue or collected by itself is simply food stored up to be used as required for the production of heat but not motion.

3. The digestive system of the horse consists of a continuous tube about 100 feet long, open at each end, made up of sections of various shapes, sizes and structures, with various organs located along and opening into it. This entire canal is lined with a soft, red *mucous* membrane, as are all other body cavities opening to the air, such as those of the nose, eyes, ears, etc. (Closed body cavities such as contain the heart and lungs, the stomach and intestines, etc., are lined with *serous* membrane). These membranes are kept moist and soft by fluids (*secretions*) that are constantly being made or *secreted* by glands in their tissues. The mucous membranes are thus moistened by *mucus* such as that which drips

from the nostrils, and the serous membranes by a more watery (*serous*) fluid. The condition of these membranes and their secretions is an important guide in judging the health of an animal (p. 266).

The digestive organs or tracts and their duties are, briefly, these: (a) *Mouth*, including tongue and teeth; this takes and chews food and mixes it with saliva (*spittle*) which is the first of several digestive fluids. (b) *Pharynx*, a firm walled passage or box with openings into both the windpipe and, (c) the *Gullet* (*esophagus*), a tube about 4½ feet long that carries food to the (d) *Stomach*, a U-shaped, muscular-walled sac holding 2 to 4 gallons, which both stores up food and continues digestion by secreting and mixing with it *gastric juice*. This goes on continuously so that the stomach is never completely empty. Food leaves it as an acid mass called *chyme*, passing into the (e) *Small intestine*, a tube about 1½ inches in diameter and 75 feet long. This has 3 sections; in the first the chyme is changed into a non-acid, milky mass (*chyle*) by the action of bile, secreted by the liver, and a juice secreted by another organ



FIG. 322. A typical joint (the stifle); *s* thigh; *f* leg bone; *c* cartilage; *l* ligaments.

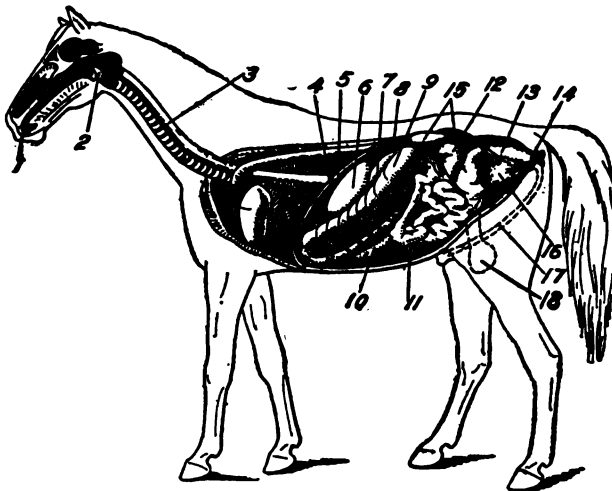


FIG. 323. Principal digestive organs of the horse; 1 mouth; 2 pharynx; 3 gullet; 4 diaphragm; 5 spleen; 6 stomach; 7 first part of small intestine; 8 liver; 9 large intestine; 10 cecum; 11 small intestines; 12 part of colon; 13 rectum; 14 anus; 15 kidney and its duct (*ureter*); 16 bladder; 17 urethra; 18 scrotum.

(the *pancreas*). These juices enter the intestine through tubes or ducts. The other two sections of the intestine absorb part of the food materials from the chyle. (f) The large intestine, about 25 feet long, includes the water bag or "second stomach" (*cecum*) some 3 feet long with a capacity of about 7 gallons, which holds the chyle 24 to 36 hours; the large colon 10 to 12 feet long, holding about 20 gallons; the small colon about the same length but holding less than a third as much; and the rectum about a foot long, through which un-

digested food and waste matter are carried to the anus and expelled as *feces* (dung or droppings). The term manure, though commonly used, means really a mixture of feces, bedding, etc., used as a fertilizer and will be so used in this book.)

On the digestive system depends the support and efficient working of the body; any derangement is therefore important both as a symptom and as a cause of other trouble. The appetite and manner of eating, the amount and condition of the feces (p. 266), and the general condition of the body (p. 266) are important guides to the way in which the digestive system is working.

The grown stallion has 40 teeth, or, in each jaw, 6 nippers (*incisors*), 2 tusks (*canines*), and 12 grinders (*molars*); the mare commonly has no tusks. There are two sets of nippers and of the first 12 molars (called *pre-molars*). The first (temporary or milk) teeth are small, white and smooth; the permanent teeth are larger, cream colored and with a dark groove down the front. By the order in which the teeth come into place and the manner and rate at which the

nippers wear down, the age of the average horse can be told, though it takes much practice to become an expert. In addition to its shape and position there is on the bearing or table surface of each nipper a mark or dark ring where the hard outside enamel folds into the tooth; this changes markedly but uniformly as age progresses. These suggestions and Figs. 324, 325 explain some conditions found at different ages.

4. The breathing system includes the *nostrils* (and mouth); the *pharynx* already mentioned; the *larynx*, a short wide tube that (a) contains the membranes that make the voice sounds, and (b) regulates the passage of air in and out; the *trachea* or windpipe which divides into 2 tubes or *bronchi*, each of which runs to a *lung*, and there branches into many smaller and smaller tubes. The serous membrane lining the chest cavity and enclosing the lungs, etc., is called the *pleura*. The muscular wall separating the chest cavity from the abdominal cavity is the *diaphragm*. When at rest this bows upward, like a bowl turned upside down.

Breathing consists of *inspiration* or drawing in of fresh air, and *expiration* or blowing out of impure, "used" air. The first is caused by the spreading of the ribs and the flattening of the diaphragm, which enlarges the chest cavity and lets the lungs expand and draw in air. In the lungs, this fresh air gives up its oxygen to the blood and takes up in return a gas called *carbon dioxide* which contains the waste and poisonous matter picked up by the blood in different parts of the body. As soon as this is done, action of the muscles of the chest and diaphragm, and the contraction of the lungs drive out the impure air. Both the rate and manner of breathing, including its sounds, regularity, etc., indicate the condition of the horse and the nature and severity of any derangement of this system.

5. The circulatory system handles the blood and also the *lymph*. The latter is a clear, yellowish fluid, which flows through tubes or *lymphatics*, carries food to the tissues, removes waste matter, and makes up part of the lubricating oil of joints and serous body cavities. The blood system includes the *heart* which is a

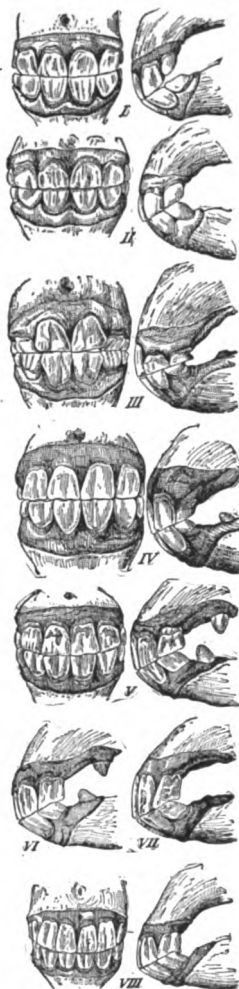


FIG. 324. The teeth of the horse at different ages as seen from front and side. I 1 year; II 2 years; III 3 years; IV 4 years; V 5 years (full mouth); VI 8 years; VII 10 years; VIII 15 years.

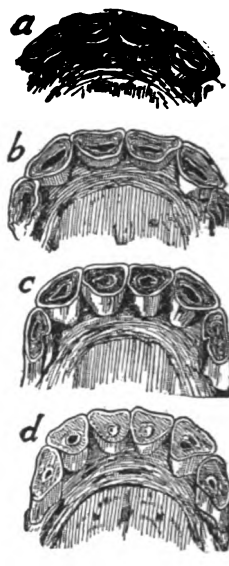


FIG. 325. How the grinding surface or table of the upper teeth changes with age. a 5 years; b 8 years; c 11 years; d 15 years.

muscular pump; the *arteries* or pipes which carry pure, red blood from its left chamber to all parts of the body; the *veins* which carry impure dark blood to the right chamber of the heart and thence to the lungs to be purified; and the capillaries or tiny tubes that connect the arteries and veins in the tissues. Blood consists of a colorless liquid (*plasma*) which carries two kinds of corpuscles or cells; red ones which carry oxygen and carbon-dioxide; and white ones, which have the power to destroy germs at work in the body, and therefore protect it and assist in the healing of wounds. The working of the blood system can be examined by means of the "pulse" or throb of an artery as a new wave of blood is sent through it (p. 266). This is felt under the jaw-bone (Fig. 333). The trained veterinarian can also get information by listening to the heart noises.

6. The urinary system includes the *kidneys* which extract certain waste matters, chiefly *urea*, from the blood; the *ureters* or tubes which carry the urine so secreted to the *bladder* in which it is stored; and the *urethra* or canal through which the urine is discharged several times a day.

The genital system differs in the two sexes. In the male it comprises the *scrotum* enclosing the organs (*testes*) in which the reproductive bodies (*sperm cells*) are formed; other organs and canals which make and store up the fluid (*semen*) containing these cells; and the *urethra* (see above) which, running through the *penis*, carries the *semen* into the vagina of the mare during service. In the mare there are the ovaries in which the egg cells (*ova*) are born; the *oviducts* which carry ripe ova into the

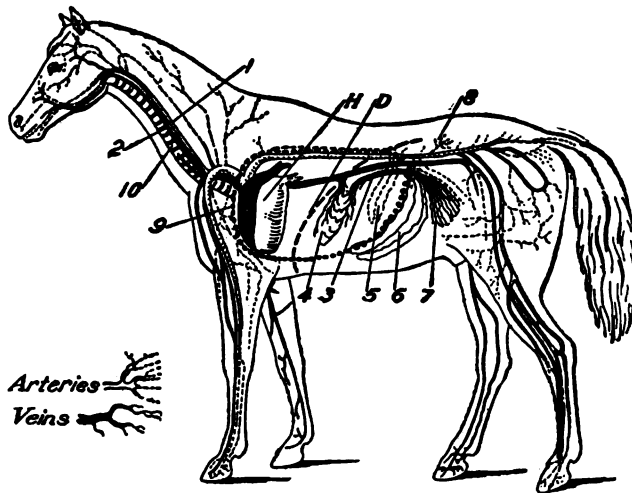


FIG. 327. Blood and breathing system of horse. 1 carotid artery; 2 windpipe; 3 vein carrying blood from stomach, spleen and intestines to liver; 4 blood vessels of liver; 5 arteries of stomach; 6 veins of large intestine; 7 of small intestine; 8 artery of kidney; 9 position and extent of left lung; 10 heart; 11 diaphragm.

womb during periods of heat; the womb (*uterus*) in which the ova are fertilized by the sperm cells, and in which the young (*fetus*) develops; and the canal (*vagina*) through which the sperm cells reach the egg cells and the fully developed fetus is carried to the outer opening (*vulva*) and expelled. Associated with this system is the mammary gland or udder, two-lobed in the mare, but similar in structure to that of the cow (p. 434).

Horses arrive at breeding age when about 1 year old, but should not be bred until 2 or 3 years old (see Chapter 2). Periods of heat occur in the mare every 3 weeks normally, and 4 to 12 days after foaling. They last for 3 to 6 days. The *gestation* period (between service and the birth of offspring) ranges from 300 to 400 days with 336 as the average.

7. The nervous system centres in the brain and spinal cord from which nerves extend throughout the body. Voluntary nerves are made up of bundles of small fibres and carry impulses or directions much like telegraph wires. There are *motor fibres* which carry orders to the muscles and therefore control their action; and *sensory fibres* which carry messages to the brain and thereby enable parts of the body to experience sensations (of taste, feeling, hearing, etc.), which they could not do of themselves. A special system of nerves controls the involuntary muscles (p. 262). At intervals along the spinal cord and the course of other nerve systems are nerve masses or "sub-stations" called *ganglia*. Since this is the controlling system of the entire body, any derangement or failure to act properly may show itself by any one of

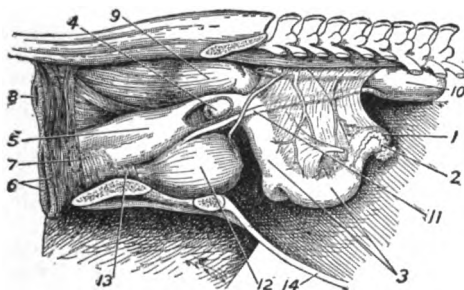


FIG. 326. Reproductive and urinary organs of mare. 1 ovary; 2 its tube; 3 uterus; 4 end of uterus inside vagina (5); 6 vulva; 7 clitoris or gland; 8 anus; 9 rectum; 10 kidney; 11 ureter; 12 bladder; 13 urethra; 14 wall of abdomen.

many different signs. Mere excitement may thus affect breathing, digestion, etc., not otherwise out of order; on the other hand, a serious but hidden nervous disorder may cause slight but nevertheless important changes.

The special senses of hearing, seeing, smelling, tasting, and feeling are mainly nerve processes, each with its special outfit of bones, muscles, nerves, secretions, etc., and its own method of working. All of these are important helps in studying the condition of the animal.

How to Recognize Horse Diseases

The ability to determine the nature, location, and identity of a disease in an animal must be based on exact knowledge of how that animal looks and acts when well. This calls for a careful, thorough study of large numbers of healthy animals of all ages. If the normal features and actions are well known it is easy to detect variations and abnormal conditions. In the horse the most important and valuable characters to keep under observation are the following:

Mucous membranes. Normally a rosy pink; *dark red color* indicates congestion, inflammation, or fever; *pale* indicates lack of blood from sickness, bleeding, or presence of worms; *yellowness* indicates derangement of the liver; *purple spots* point to *purpura hemorrhagica* (p. 277); and *blueness* to lead poisoning or impending death.

Skin and coat. *Harsh, long, dry, "starving"* coat usually grows from a "hidebound" skin, indicating general lack of condition the result of indigestion, worms, improper feed, starvation, lack of grooming, or insanitary housing. *Dry, hot skin* commonly indicates fever. *Sweating*, when not due to work or exercise, indicates acute pain as in colic (p. 273), or azoturia (p. 269), tetanus (p. 270) and certain nerve disorders.

Feces. Any change from normal indicates derangement of digestive organs. *Constipation* and *clay-colored droppings* suggest sluggishness of liver; *slimy, hot feces* point to fever; *stinking feces* to fermentation and indigestion.

Urine. Normally pale or slightly reddish yellow, not entirely clear; 4 to 7 quarts generally voided daily. Change in either appearance or amount constitutes a symptom. *Scant, high-colored or honey-like urine* accompanies indigestion (p. 272); *dark, coffee-colored urine*, azoturia (p.



FIG. 329. Taking note of heart action by placing hand on side just back of elbow.

269); *bloody urine*, acute kidney disease, injury or presence of stone or gravel in bladder; *colorless urine* in great quantities, diabetes (p. 274).

Discharge from nostrils. Normally colorless, watery. *Scant, greenish-yellow, sticky* may indicate glanders (p. 424); *copious, yellow* indicates cold (p. 275), influenza (p. 275) or strangles (p. 274); *rusty looking*, suggests bronchitis (p. 276), pleurisy (p. 276); *pneumonia* (p. 276); *yellow, foul smelling*, suggests "nasal gleet" (p. 275); *bloody* suggests *purpura hemorrhagica* (p. 277).

Temperature. Normally 100 degrees F. Taken by inserting clinical thermometer (Fig. 330) in rectum for 3 to 5 minutes. *Increase* indicates fever; *decrease*, weakness, lack of "tone."

Pulse. Normally 30 to 45 beats per minute, steady. Taken by placing fingers over the artery that crosses the bone at the fork of the jaw (Fig. 328). Change in speed or condition (full, bounding, small, intermittent, wiry, weak, etc.) indicates deranged condition or action of heart.

Respiration (breathing). Normally 8 to 18 breaths per minute. Taken by placing hand on the flank while watching second hand of a watch. *Double, bellows-like* action of flank in breathing out is a sign of heaves; *hurried breathing* when not due to exercise may accompany fever or indicate pain.

Position. *Lies down* and *rolls* in colic (p. 273); *"climbs the wall"* or remains apparently asleep in brain troubles; *stretches and strains* in impaction (p. 272); *stands with elbows turned out* in pneumonia (p. 276); *advances both fore and hind feet* in founder (p. 280); *goes down* in azoturia (p. 269); *sits on haunches* in stoppage of bowels (p. 272); *gallops* in delirium when down in tetanus (p. 270), cerebro-spinal meningitis (p. 270), or fatal azoturia (p. 269).

Appearance of face, eyes, ears and nostrils, expression, appetite and spirits are also highly important characteristics and should be carefully observed.



FIG. 328. Taking horse's pulse

Index of Symptoms

To use this key, (1) look down the list of symptoms and check off any that appear in the sick animal; (2) see if the same number or letter occurs after all the conditions thus picked out; (3) if so, turn to the disease bearing that number, read the more detailed description given there, and if you are fairly certain that you have located the trouble follow the directions given. To illustrate: if your horse has become thin, weak, hidebound and generally poor, if it shows a tremendous thirst, and passes a colorless urine often, by fits and starts, you will find these characters listed under Condition (hidebound and weakly, thin), Thirst, and Urine and following, in each case, the number 17; turning to disease 17, you are reminded that the animal has recently received by accident considerable moldy hay, or has been grazing on low, swampy land, which bears out the theory that the trouble is Diabetes insipidus, which you proceed to treat according to directions. "F" refers to Glanders (p. 424.)

Abscesses	19-20	Face	Bones of, bulge—23
Ankles	knuckle over—1	Feet	Fore feet extended; rests on heels—37
Anus	Scaly substance and streaks of mucus around—54		Hind foot advanced—37
Appetite	Depraved—13		Holds foot off ground—50
	Gluttonous—8		Hot, sensitive—50
	Loss of—2, 6, 12, 19, 21, 22, 27, 29, 30, 48, 62	Fever	Points with—48-51
Bleeding	Sudden, from nose—(F, p. 424)		6, 8, 19, 21, 30, 62
Bloating	7-9		Slight—22
	in right flank only—16		Very high—7
Bowels	Frequent passage of—12-16	Gas	gushes up gullet—14
	Feces bad smelling—13		passes frequently from rectum—18
	clay colored—13	Growth	Bony, on course of small splint bone—41
	covered with mucus—29		36, 38, 40, 40a
	retained—15	Heat	Skin of, red swollen—61
	stopped—10-11	Heels	Swelling on, 40a
Breath	Foul—17	Hock	Bony enlargement near heel—44
Breathing	Difficult, breathing out—3	Hoofs	crack, bleed—47
	Double action in—3		Dry—51
	Fast—9, 17, 26		and hard—46
	Roaring—25		Enlarged hoof-head—45
Chill	Short and labored—16, 28, 29, 26		Red discoloration of sole—48
	followed by fever—2, 20, 21, 27, 28, 29, 37		Rings on—37
Condition	Dull—22		Smelling discharge from frog—49
	Hidebound 13, 18, 51	Indigestion	10, 13, 18, 21
	Losing flesh—12		Chronic—54, 55
	Poor generally—3, 67—F.	Itching	58
	Rough and hard coat—13	Jaws	locked—4
	Weakly, thin—18		Swollen glands under, F
Cough	3, 9, 20, 21, 22, 24, 27, 29	Kicks	in stable—67
	Chronic—25	Lagging	suddenly, after driving—1
	Dull, dry—(F, p. 424.)	Lameness	35, 38, 39, 43, 44, 45, 47, 52
Coughs	up bloody mucus—(F, p. 424)		at trot, increasing with exercise, disappearing with rest—41
Delirious	7		in foot—48
Discharge	from nose—21, 22, 27, 29, 30 (F, p. 424)		of joints or muscles—31
	Chronic—23		Painful—2
	Foul smelling (see diseased molar tooth p. 382)	Legs	Constant jerking of—33
	from skin—30		Enlargement on pastern—4
Elbow	Tumor on point of—40		Hind leg jerks suddenly—32
	turned out—28-29		straightened, thrust backward—34
Eyes	Bloodshot—26		Lumps on hock joint—35
	Cloudy or yellowish—6		Soft swelling on elbow—40
	Haw extends over eyelids—6		swelling over night—13
	Lids swell and close—6	Manure (Feces)	clay-colored—13
	twitch—5		covered with mucus—25
	wrinkled, triangular—6		Worms found in—54
	Purple spots on lids—30		
	Redness of—17		

General Diseases

1. Azoturia

Partial or complete paralysis of the hind quarters, sometimes mis-called spinal meningitis (p. 270).

Symptoms. *The horse goes out feeling well, suddenly lags, sweats, "knuckles over" at the hind fetlocks, and the muscles of the hip, croup and thigh contract and harden. The urine is the color of strong coffee. If driven farther, he goes down paralyzed with feces and urine retained. In severe cases he becomes delirious, gallops when down and quickly dies; in mild cases, with one leg attacked, he often stands and quickly recovers. After recovery the affected muscles may waste away.*

Cause. Idleness for one or more days on full feed, especially oats. The commonly accepted theory is that the system becomes overcharged with nitrogenous matters and poisonous substances form and cause the attack when the horse is worked or exercised. Plugging of blood vessels (embolism) may also be suspected as a possible cause.

Treatment. (1) Instantly rest the horse at outset of attack. (2) Remove harness and keep horse on feet. (3) Apply blankets or sacks of bran wet with hot water to the loins, hip, and croup. (4) Give $1\frac{1}{2}$ to 2 grains of arecoline with a hypodermic syringe, or a physic of $1\frac{1}{2}$ pint of raw linseed oil, or 12 ounces of epsom or glauher salts in a quart of lukewarm water. (5) Follow with 1 dram of iodide of potash in water every 4 hours. (6) Give rectal injections of soapy warm water at intervals of 3 to 4 hours. (7) Draw off urine with a catheter (p. 386) if horse goes down.

Support the horse with slings (Fig. 331) if he has difficulty in standing, and in all

"down" cases try to get him up and into slings after the third day. In all severe cases employ a trained veterinarian who will treat

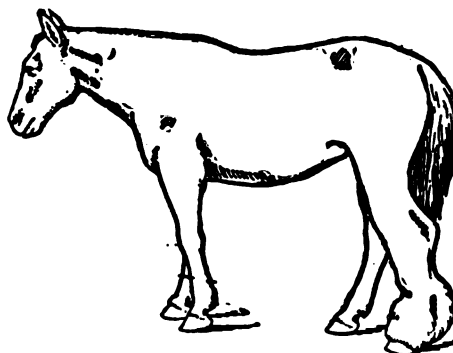


FIG. 332. Chronic, incurable enlargement following attacks of lymphangitis

symptoms as they arise. If the muscles waste after the acute attack subsides clip off the hair and apply a blister (p. 371) as often as the state of the skin will allow.

2. Lymphangitis

Sometimes called "Monday morning disease," "milk leg," "big leg," or a "shot of grease." Acute inflammation of the lymphatic vessels (p. 264), usually of a hind leg. Caused by idleness for one or more days while on full feed; also, possibly, by the infection of a scratch or wound by bacteria.

Symptoms. *Chill, followed by fever. Fast, full pulse. Sweating, panting and loss of appetite. Lameness with swelling and great sensitiveness of the lymphatics on the inner side of the thigh and groin. The swelling "pits" under pressure and descends until the entire leg is distended, then the severe symptoms abate. Attacks are likely to recur and leave the lower part of the leg greatly enlarged, an incurable condition termed "elephant leg" (elephantiasis).*

Treatment. (1) Stop grain feed and allow bran and hay. (2) Bandage the affected leg loosely from foot to body with a soft straw or hay rope and keep saturated with hot water in winter and cold water in summer. (3) Give 1 to $1\frac{1}{2}$ pint of raw linseed oil. (4) Dissolve 2 to 4 teaspoonfuls of saltpeter in the drinking water (kept always before horse) every 6 hours for 2 days, then give half the dose twice daily. Or give the saltpeter in water as a drench if horse will not take it otherwise. (5) Hand rub the leg often, and twice daily apply freely a lotion composed of 1 ounce of sugar of lead and a pint each of vinegar and water. (6) Allow walking exercise after all inflammation subsides.

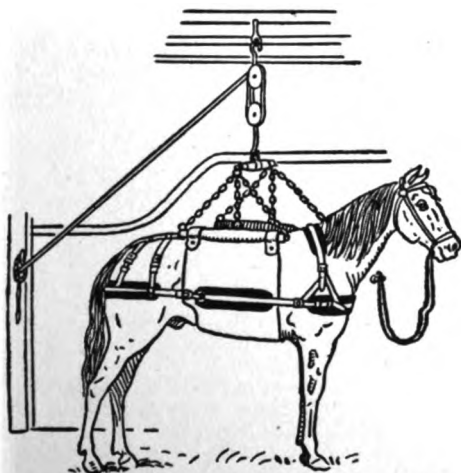


FIG. 331. Arrangement for supporting horse in slings

3. Heaves (Broken Wind)

A chronic, non-infectious disease in which the air vesicles of the lungs are broken down and the digestive organs deranged. It constitutes unsoundness and the tendency to it is considered hereditary. Incurable when established.

Symptoms. *Difficulty in expiring (breathing out) accompanied with a double, bellowslike action of the abdominal muscles ("heaving of the flanks"), cough and forcible passing of gas from the rectum. The horse has a gluttonous appetite and "pot belly"; is thin, weak, thriftless, hidebound, sweats profusely and tires quickly at work.*

Cause. Working a horse when the stomach is distended with coarse, bulky feed; over-feeding of dusty, woody timothy or marsh hay; or threshed second growth clover hay; over-exertion; effects of influenza, pneumonia or other lung disease.

Treatment. No cure. To relieve distress (1) Feed grass in summer and wet oat sheaves or straw in winter instead of hay. (2) Wet all feed with lime water. (3) Do not work the horse soon after a meal. (4) Don't give bulky feed at noon when work has to be done. (5) Keep bowels active. (6) Give 1 tablespoonful ($\frac{1}{2}$ ounce) of Fowler's solution of arsenic twice daily for a week, then three times daily. Double this dose often is given. Heave powder (p. 372) also is useful. Feed bran mash containing raw linseed oil, or a little silage or roots to regulate the bowels. Bed a gluttonous horse with sawdust or shavings. Call a veterinarian for aggravated cases.

4. Lockjaw (Tetanus)

An infectious disease affecting the nervous system and characterized by spasms of the muscles. Caused by invasion of a wound by the tetanus germ which is commonly present in horse manure, stable filth, farm soils, etc. The disease appears in from 2 to 5 days after infection.

Symptoms. *The horse is excitable and nervous. The muscles stiffen, the ears are rigid, head extended, nostrils dilated, tail elevated and the membranes ("haw") from the inner corners of the eyes protrude partly over the eyeballs when the horse moves. In some cases the jaws are locked. In acute cases the horse soon falls, sweats profusely, has acute spasmodic contractions of the muscles (spasms) and dies.*

Treatment. There is no certain remedy. In all cases, locate the original wound and saturate with tincture of iodine without greatly exciting the horse. In mild cases (1) tie horse short in a quiet, darkened, well ventilated box stall and keep every one but attendant away. (2) Set water and soft feed high so horse can take them without bending. (3) Dissolve 2 to 4 tablespoonfuls of

glauber salts in the drinking water once daily if the horse is constipated. (4) Give quieting drugs if prescribed by the veterinarian; or if the horse is very valuable try treatment with tetanus antitoxin.

5. Cerebro-Spinal Meningitis, "Forage Poisoning," "Blind Stagers"

A non-infectious disease deranging the functions of the brain and spinal cord. The cause has not been determined but is supposed to be poisonous fungi or molds in feed. A recovered horse is not immune.

Symptoms. *The attack may be ACUTE or SUB-ACUTE. In the acute form the horse quickly weakens, staggers, goes down, has spasms of the neck, becomes delirious and dies in 10 to 24 hours. In the sub-acute form there is gradual weakness, slobbering, difficult swallowing, staggers, twitching of eyelids, rolling back of eyeballs and at length the horse goes down, has spasms and cramps of the neck and jaws and dies after 7 to 10 days of sickness.*

Treatment. No specific remedy known. Veterinarians give arecolin ($\frac{1}{2}$ grain), atropin ($\frac{1}{2}$ grain), etc., with a hypodermic syringe and support the horse with slings. Prevention is all-important. When an outbreak occurs, keep horses off pasture and give feed bought at a distance. Avoid surface water. Keep the bowels active. Immediately employ a qualified veterinarian.

6. Moon Blindness (Periodic Ophthalmia)

An inflammation of the structure of the eye commonly termed "moon-blindness." Incurable when established.

Symptoms. *Suddenly and at intervals of about 60 days the eyelids swell and close; tears flow; the membranes of the eyelids turn red and the eye assumes a bluish or pearly color, while a deposit of yellowish matter may be seen at the lower part of the cornea or front chamber. In a week or so the inflammation gradually subsides and the eye clears. Fever and lack of appetite usher in the attack. Blindness of one or both eyes results from cataract following repeated attacks. After several attacks the eyelids appear triangular and the eye somewhat dull and sunken.*

Cause. Tendency to the disease is considered hereditary, but it is most common in low-lying districts and among horses kept in insanitary stables or poorly fed and cared for. By some the disease is considered infectious, but no special organism causing it has as yet been found.

Treatment. No cure. Relief in some cases follows puncture of the cornea and letting out a part of its liquid contents. Severity of attack may be lessened and blindness retarded by removing all irritating influences and at the outset of the attack (1) darkening

the stable; (2) covering the eyes with a soft cloth to be kept constantly wet with a lotion composed of $\frac{1}{2}$ dram each of sulphate of zinc and fluid extract of belladonna leaves, 10 drops of carbolic acid and 1 quart of cold water; (3) dissolving 1 dram of iodide of potash in the drinking water twice daily.

After the acute attack subsides wet the eyeball once daily with a solution of 2 grains of nitrate of silver in 1 ounce of distilled water to be kept in a blue glass bottle. A 15 per cent solution of argyrol dropped between the eyelids once daily also is useful.

7. Sunstroke and Heat Exhaustion

Symptoms. In **SUNSTROKE**, which is acute, the horse suddenly stops sweating, has very high fever, staggers, falls, becomes unconscious, delirious and soon dies. In **HEAT EXHAUSTION** the fever is less high, the horse stops sweating, has rapid pulse, red mucous membranes, pants, often bloats on right side, and may scour.

Cause. Sunstroke comes from prolonged work in the direct rays of the sun. The middle horse in a three-horse team is particularly liable to attack because of the extra heat reflected from his mates. Indigestion or other sickness usually precedes heat exhaustion.

Treatment. Most attacks of sunstroke quickly prove fatal. Heat exhaustion responds to prompt treatment. (1) Stand horse in a shady place where there is a breeze. (2) Sprinkle body with cold water and keep cold wet packs or a stream of cold water on the poll. (3) Give rectal injections of cold water in acute cases. (4) Administer strong stimulants such as 4 to 8 ounces of whiskey or brandy with half a pint of water, or 2 ounces of a mixture of 2 parts alcohol and 1 part each of aromatic spirits of ammonia and nitrous ether in a pint of water once an hour until relieved. (5) If horse is bloated tap (p. 387). (6) During recovery feed lightly, keep horse cool and quiet and dissolve 1 dram of iodide of potash in the drinking water night and morning for 5 consecutive days a week, or 2 weeks if animal appears stupid or dizzy.

In acute sunstroke send for a veterinarian and while waiting do everything possible to cool the horse. Don't work a horse in extremely hot weather when his feces show that his digestion is deranged.

8. Navel and Joint Disease (Pyemia)

An acute, infectious disease affecting first the navel and secondarily the joints of newborn foals. Caused by infection of the stump of the navel at birth by germs from filthy bedding, floor or ground. Weak foals most commonly get it and most readily die of it.

Symptoms. Soon after birth the foal has fever, stops sucking and a joint becomes swollen, hot, and intensely painful. Pus may be found

in the swollen stump of the navel and then forms in the affected joints (Fig. 333). The foal usually weakens rapidly and dies. Partial recovery may occur in some cases but chronic incurable swelling and lameness of joints remains, or bog spavin (p. 285) or dropsical stifle results.

Treatment. Swab the navel and affected joints freely with tincture of iodine and let out the pus. Hypodermic treatment with serum or bacterin should be given by a veterinarian. **Prevention** is all-important. Have the foal born on grass or in a clean, disinfected, whitewashed, freshbedded box stall. Instantly at birth saturate the stump of the navel with tincture of iodine, or a 1-500 solution of corrosive sublimate; afterward apply finely powdered and sifted slaked lime twice daily. Repeat the applications of iodine, etc., if the navel does not shrivel promptly. Serum or bacterin injected at birth by a veterinarian also helps to prevent the disease.

9. Choke

Symptoms. Distress, cough, fast breathing, bloating, "slobbering," sweating, trembling, the head and neck are extended and horse may shriek and attempt to vomit when spasms occur. Food and water return through the nostrils.

Cause. Lodging in the gullet of grain, dry bran, wheat chaff, an egg, a root, physic ball or other object.

Treatment. If close to the throat the lodged substance often can be felt, pushed toward the mouth and removed by hand. An egg may be broken by pressure. If farther down or even near the chest (1) pour 2 ounces of sweet oil, cottonseed oil, or raw linseed oil into the gullet every 4 or 5 minutes and have assistant rub with palm of hand up and down the gullet outside. (2) Massage gullet if packed with grain, etc. (3)



FIG. 333. Colt affected with navel and joint disease. Notice swelling in right fore and left hind legs and thin condition. (Wisconsin Circular 61).

Give 3 to 5 grains of pilocarpin hydrochloride in water with a hypodermic syringe and follow in 20 minutes with 1 grain of atrophin sulphate the same way. (4) As a last resort the probang (Fig. 365) may be passed by a veterinarian but fatal gangrene commonly follows its use so that it would be better to open the gullet (p. 385).

10. Constipation

Symptoms. *Failure to void feces; also usually the symptoms of chronic indigestion (see below) and slight, colicky pains.*

Cause. Lack of exercise, overfeeding of grain, bran, cut hay, or chaff; coarse, weathered, or damaged fodder, corn stalks, or bulky, innutritious feed of any kind with too little juicy or laxative feed, or water.

Treatment. (1) Remove cause. (2) Feed soft, succulent or laxative feed, including silage, carrots, etc. (3) If then necessary, give bran mash mixing in each 2 ounces of raw linseed oil. (4) Enforce active exercise daily.

If colicky pains are present, give half a spasmodic colic drench (p. 371) and follow with a pint of raw linseed oil. In more urgent cases, give 2 ounces of the following mixture every 2 hours: Fluid extract of nux vomica, 6 drams; fluid extract of colchicum seeds, 1½ ounce; fluid extract of physostigma, 1 ounce; add water to make 12 ounces.

Treat constipation in new born foal by gently injecting into the rectum a cupful of warm sweet oil, or a mixture of 2 teaspoonfuls of glycerine in a cupful of warm water. Repeat every 3 hours. Hard feces often block the rectum and must be removed with the fingers or forceps after softening with injections. If a physic proves necessary, give 2 to 4 ounces of a mixture of 1 part of sweet oil or raw linseed oil and 2 parts of best castor oil, shaken up in milk. If pain is present, add half to 1 teaspoonful of laudanum according to size of foal.

11. Impaction

Stoppage of the bowels with feces. The causes are the same as those of constipation.

Symptoms. *Colicky pains are more severe and constant than in constipation and the horse also paws a great deal and strains frequently and severely. If due to a gut-tie or a similar obstruction, the horse often sits on his haunches like a dog.*

Treatment. (1) Pass the oiled hand and arm into the rectum and remove feces. (2) Give rectal injections of warm water and glycerine. (3) Give 1½ pint of raw linseed oil and 2 drams of fluid extract of nux vomica and then 1 pint of oil and the dose of nux at intervals of 12 hours. (4) To quiet pain give 2 drams of fluid extract of cannabis indica in a little oil as often as necessary, or give half a spasmodic colic drench (p. 371) and repeat when needed.

Stoppage of the bowels due to twisting (gut-tie) or telescoping, or hernia of the bowels is hopeless. Enteritis (p. 274) follows and suffering is acute. An aloes purgative ball given in impaction may also cause enteritis.

12. Diarrhea

Symptoms. *Frequent passages of semi-liquid feces, sometimes accompanied by pain, loss of appetite, loss of flesh, and other signs of ill-health.*

Cause. The usual causes are those of indigestion (p. 273). Worms, or diseases such as influenza, pneumonia or heat exhaustion may also cause it. Some long-coupled, "washy" horses always scour when driven until hot and tired, especially if allowed much water before work.

Treatment. (1) Remove cause, where possible. (2) Give ½ to 1 pint of raw linseed oil, if horse has gorged on grain. (3) Add ½ to 1 ounce of laudanum if pain is present. (4) If scouring is severe, give in gruel 2 drams each of subnitrate of bismuth and powdered catechu and 1 dram of salol, adding ½ to 1 dram of powdered opium if pain is present and repeat as required. (5) In milder cases, mix in the feed 3 times daily a tablespoonful of a mixture of 2 parts of prepared chalk and 1 part each of powdered catechu, ginger and subnitrate of bismuth.

Fluid medicines should be given in rice, starch, or flour gruel. Powders also may be given in gruel if the horse will not eat drugged feed. Browned wheat flour mixed in the feed will help to prevent a "washy" horse from scouring.

If a new born foal scours give 1 to 3 tablespoonfuls of castor oil in milk and follow with 1 to 2 teaspoonfuls of a mixture of 2 parts of subnitrate of bismuth and 1 part of salol in a little boiled milk 2 or 3 times daily according to size of foal and severity of the case. Change feed of mare to dry hay and grain.

13. Indigestion (Chronic)

Symptoms. *Changeable or depraved appetite, unnatural thirst. Horse may lick walls, eat soiled bedding, earth, wood, manure, etc., have a rough and harsh coat, hidebound skin, sweat profusely and tire quickly at work. Urine is thick and creamy, or profuse and colorless; the feces are bad smelling, mushy or hard, clay-colored or covered with slime; gas passes frequently from the rectum. The hind legs "stuck" overnight.*

Cause. Irregular feeding and watering; damaged, moldy, or otherwise unfit feed; bolting of whole or ground grain; lack of grooming; worms; excess of lime in water; dark, damp, dirty, badly ventilated stables; wrong use of drugs.

Treatment. (1) Remove cause. (2) Have

teeth attended to by a veterinarian. (3) Clip, if coat is long and rough. (4) Feed from wide, shallow box to prevent bolting. (5) Allow free access to rock salt. (6) Give work or exercise. (7) Put in box stall and hand rub and bandage legs from feet to knees and hocks each time horse comes in. (8) Give indigestion powders (p. 372).

An aloe physic ball (p. 367) or dose of raw linseed oil often is helpful at the outset of the treatment. Fowler's solution, as for heaves (p. 367), may be tried in obstinate cases.

14. Indigestion (Acute)

Stopping of digestion accompanied, in most serious forms, by inflammation of the membranes lining the stomach, paralysis of the muscular coat of the stomach, rapid formation of gas, and bloating.

Symptoms. *Uneasiness, restlessness, pawing, moving about, pain, sweating, lying down and getting up again quickly, looking round at sides, rushing or gushing of food up and down gullet, attempts at vomiting and belching, spasms as in choke (p. 271), distressed countenance, small, quick, weak pulse.*

Cause. Irritating poisons, bolting of feed; feeding when tired and sweaty; damaged feed; sour bran mash or reheated wheat or barley mashes; or any cause of colic.

Treatment. Home treatment seldom avails. (1) Give 2 drams of salicylic acid, preferably in a capsule, and repeat in half an hour if necessary. (2) Give 2 drams of salicylate of soda and an ounce of aromatic spirits of ammonia in a pint of water if there is bloating of the right flank; or in the absence of these drugs, give the drench prescribed for flatulent colic. (3) Once an hour inject into the rectum a mixture of 1 ounce of glycerine in a cupful of warm water. Do not walk or trot the horse.

In all severe cases, especially gastritis from poison, instantly call a veterinarian who should pass a stomach tube (p. 386) to siphon gas and liquid from the stomach and give hypodermic injections of suitable drugs.

15. Colic (Spasmodic or Cramp)

Abdominal pain produced by a spasm of the muscles of the bowels.

Symptoms. *Violent pain which "comes and goes," but no fever. Pulse fast, full, excited. During attack horse looks around at sides, sweats, paws, strains, rolls recklessly and violently, and may lie on his back. Feces and urine are retained. Pain subsides, horse becomes quiet and may start eating but soon has another attack. Bloating rarely occurs.*

Cause. The causes of all forms of colic are the same; if the following are avoided, colic and kindred ailments will become less common: improper kind, quality, or quantity of feed; irregular feeding; sudden changes in

feed; new oats or new hay; lack of exercise; feeding when horse is hot and tired; watering after a meal or when horse is hot and tired; heat exhaustion (p. 271); driving heated horse into deep, cold water; exposure to cold rain or draughts; washing; bolting of feed; allowing a hot, tired horse unused to grass to eat it at roadside while resting. Additional causes are: hair, dust or lime balls in the bowels; effects of intestinal worms, indiscriminate use of drugs.

Treatment. (1) Remove harness, turn horse into a large, well-bedded box stall or on grass and permit rolling. (2) Give a dose of spasmodic colic medicine (p. 371) or some bought from a veterinarian. (3) When the pain ceases, give a pint of raw linseed oil.

Do not gallop horse, or give irritating rectal injections. The pain is not due to

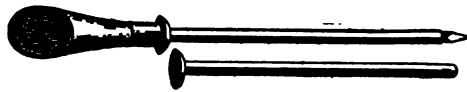


FIG. 334. Trocar and cannula together (above) and cannula alone (below)

retention of urine. Urination will occur when pain subsides. Do not allow horse to eat hay between attacks. Feed very lightly after attack subsides. Call a veterinarian if pain persists.

16. Colic (Flatulent or Wind)

Symptoms. *Bloating of the right side of the body most noticeable in the upper flank, between the point of the hip and the last rib. Pulse fast and weak. No fever. Breathing short and labored. Nostrils flap when suffocation threatens. Urine is retained. Feces may pass frequently in small quantities and are soft and foul-smelling. Other symptoms as in spasmodic colic (see above) but pain is less severe and tends to persist.*

Cause. Same as those of spasmodic colic (bloating being caused by the fermenting of food and the formation of gas); or it may come from "cribbing" and "wind sucking."

Treatment. (1) Turn horse loose in a large, deeply bedded box stall. (2) Give 2 drams of salicylic acid and 1 ounce of aromatic spirits of ammonia in a pint of water, or a flatulent colic drench (p. 371) kept on hand for use in emergency. (3) Give rectal injections of warm water and glycerine once an hour (see acute indigestion above), unless bowels are moving freely. (4) Tap the bloated flank, high up on right side, with a long, fine clean trocar and cannula to draw off the gas (Fig. 334). (5) When relieved give 1 to 2 ounces of turpentine in 1 to 1½ pint of raw linseed oil according to size of horse.

If possible have the tapping done by a trained veterinarian who may also give

special drugs, such as eserine, with a hypodermic syringe.

17. Enteritis (Inflammation of the Bowels)

Symptoms. *Fever. Small, fast, weak or wiry pulse. Fast breathing. Redness of membranes of nostrils, eyes, etc. Dilated nostrils. Anxious look. Constant pain. Cold, clammy sweats. Hot, clammy mouth. Sour or foul breath. The horse walks in a circle, paws, often starts to lie down but fears to do so. If he goes down he may lie on his back for some time. Toward the end, walking in a circle is constant, but at last pain ceases, horse becomes quiet, the gums turn blue-black and soon the animal drops and dies. The disease is usually fatal.*

Cause. Exposure to cold rains, turning cold water from hose on a hot horse or driving him into deep, cold water. Unrelieved colic of any form. Stoppage of the bowels from any cause. Irritating poisons. Giving an aloes physic ball in inflammatory disease, or without preparing the horse (p. 372).

Treatment. At once call a skilled veterinarian to give opium or other soothing drugs. Home treatment will not avail.

18. Diabetes Insipidus

Symptoms. *Urine practically colorless, is discharged often and spasmodically. The horse has unquenchable thirst, becomes weak, thin, hidebound, easily tired and shows other symptoms of chronic indigestion.*

Cause. The feeding of moldy or otherwise spoiled hay or grain is the most common cause. Others are new or kiln-dried oats, impure water, too much salt, use of medicines irritating to the kidneys, feeding on low, flooded meadows, influenza or other debilitating disease.

Treatment. (1) Remove cause, so far as possible. (2) Furnish sound feed and allow flaxseed tea to drink. (3) Give 1 dram each of dried sulphate of iron and iodine crystals in a capsule or with flaxseed meal as a ball, once or twice daily, according to severity of case; or, (4) mix together 6 ounces each of dried sulphate of iron and resublimed iodine crystals and 1½ ounce of gentian root, divide into 6 powders and mix one in the feed night and morning. (5) When the horse improves, give 30 drops of strong hydrochloric acid in drinking water daily.

Iodide of potash in 1 to 2 dram doses twice daily or ½ to 1 ounce of syrup of iodide of iron in flaxseed tea as a drench 3 times daily often proves effective. For profuse urination in cases of influenza or similar disease give 2 drams of fluid extract of ergot every 3 or 5 hours. If urine is milky, thick or honey-like, mix 1 dram of boric acid in the feed 2 or 3 times daily.

19. Strangles (Colt Distemper)

An acute, specific febrile (with fever) contagious disease chiefly attacking young horses. Caused by a germ. A horse that recovers is not always immune to another attack.

Symptoms. *Fever, reddened membranes, discharge from nose, dullness, lack of appetite, sore throat, formation of hot, painful swellings (abscesses) under the jaws which finally soften, open and discharge pus.*

Treatment. The attack must run its course. Good nursing is important. (1) Place colt in box stall. (2) Poultice forming abscesses with hot flaxseed meal (p. 366). Some prefer to use liquid blister (p. 371). (3) Open abscess in centre when soft and syringe out daily with warm water containing 2 teaspoonfuls of coal tar disinfectant to the pint. (4) From the start give fever medicine No. 1. (p. 372) *without the saltpeter* 2 or 3 times daily to soothe the colt and stimulate its appetite. (5) Regulate bowels by dissolving 1 ounce of epsom salts in the drinking water as required. (6) Give electuary (p. 372) if throat is sore and swallowing difficult.

Irregular or bastard strangles is characterized by formation of abscesses in various parts of the body and apparently is due to unsanitary stabling and consequent impurity of the blood. Paint the forming abscesses daily with tincture of iodine and have a veterinarian give hypodermic treatment with a bacterin.

20. Laryngitis (Sore Throat)

Inflammation of the mucous membrane lining the larynx (upper part of the windpipe), often involving the pharynx (cavity in which both windpipe and gullet begin). Sometimes infectious, occurring as an epidemic.

Symptoms. *Chill, followed by fever. Nose thrust out and nostrils wide open. Throat swollen and painful to touch. Food and drink are returned through nostrils from inability to swallow. Short, sharp, repressed cough from throat. In severe cases, loud snoring, great distress and threatened suffocation. In the epidemic form, pain, stiffness and other symptoms of pleurisy (p. 276). Abscesses may form.*

Cause. Injury from whip or other instrument carelessly used to reduce choke; neglected cold, chill, exposure to draught; strong, irritant medicines; smoke, flames or irritating gases. Infection.

Treatment. Give general treatment for cold (p. 275). (1) Dissolve 2 drams of chlorate of potash in each pail of drinking water. (2) Poultice throat with hot flaxseed meal (p. 366). In severe cases sprinkle mustard on poultice. (3) Steam nostrils with hot water containing iodine or oil of eucalyptus (p. 368). Do not "smoke head"



FIG. 335. Steaming a horse for sore throat

with burning leather, tar or feathers. (4) Give electuary (p. 372). (5) If suffocation threatens have tracheotomy performed (p. 385). (6) If abscesses form have them opened (p. 384). (7) Give salol, as in pleurisy (p. 276), for soreness and stiffness of the epidemic form. (8) Give tonics (p. 372) after acute symptoms and fever subside.

21. Influenza

An infectious febrile disease commonly known as catarrhal, shipping or stockyard fever, epizootic or "pink eye." Caused by a specific germ which thus far has not been determined. The recovered horse is immune to a second attack.

Symptoms. *Chill, fever, cough, discharge from nose, redness of mucous membranes, stiffness, weakness, loss of appetite, stocking of legs. The disease takes many forms; in one affecting the digestive organs, in another the nervous system, and in the "epizootic" form, the eyes. Complications such as laryngitis, pleurisy, or pneumonia are common and often prove fatal as does purpura hemorrhagica (p. 277) which may follow influenza.*

Treatment. Hygiene, feeding and management are all important. Fatal complications usually occur in dark, damp, dirty, poorly ventilated stables. (1) Place the horse in a large, airy box stall, protected against draughts. (2) Blanket the forequarters and bandage the legs. (3) Allow free access to pure, cold water. (4) Tempt appetite with various foods. It is most important to keep the horse eating. (5) Keep the eyes and nostrils clean by washing with water and absorbent cotton. (6) Give fever medicine No. I (p. 372). (7) If the eyes are affected, cover them with a soft cloth to be kept constantly wet with cold water containing 40 drops of coal tar disinfectant to the quart. (8) In the bilious form, indicated by yellowness of mucous membranes and clay colored feces, dissolve 2 to 4 tablespoonfuls of glauber salts in the drinking water each morning. (9) If a complication arises, call a veterinarian to give special treatment.

22. Catarrh ("Cold in the Head")

Symptoms. *Watery discharge from eyes and nose. Sneezing, loss of appetite, dullness, slight fever, sometimes cough. Discharges thicken later.*

Cause. Congestion of lining membrane of nose and sinuses (cavities in the skull connecting with the nasal passages). Follows exposure; standing in draught; or infection.

Treatment. Good nursing is most important. Stop work. Allow horse a clean, well-ventilated box stall. Provide pure, cold water. Blanket body and bandage legs with flannel in cold weather. Feed light, laxative rations. (1) Dissolve a tablespoonful of saltpeter in the drinking water once daily. (2) Give fever medicine No. I (p. 372) if temperature rises. (3) If patient tends to be constipated, dissolve 2 ounces of glauber salts in the drinking water each morning. (4) Do not smoke or steam head, or give a physic ball or other purgative.

23. Chronic Catarrh (Nasal Gleet)

Symptoms. *Chronic discharge from one or both nostrils. Sometimes bulging of bones of face and a dull sound on tapping part. Discharge is free and drops or runs from the nose (compare glanders p. 424).*

Cause. May follow simple catarrh or other disease of breathing organs, or be due to a diseased molar tooth (accompanied by foul odor), pus or tumors in the sinuses, abscesses or inflammation of the throat, bronchi (the large branches of the windpipe) or lungs, or tumor in a nostril (*polypus*).

Treatment. Call a veterinarian to examine for glanders, to trephine (p. 387) for removal of a diseased tooth, or collection of pus, or to remove the nasal polypus. If an operation is unnecessary (1) Syringe out nostril once daily with a solution of 1 dram of tannic or gallic acid in a pint of water. (2) Sprinkle some chloride of lime in manger under hay. (3) Mix in feed night and morning for 1 week 1 dram of dried sulphate of iron, then for 1 week 1 dram of powdered sulphate of copper and during third week (in drinking water) 1 dram of iodide of potash. Alternate these drugs for a period of 1 week each until discharge ceases. Give all feed from floor level.

24. Cough

Symptoms. *A cough may be moist, dry, or suppressed. First there is a deep drawing in of the breath then a sudden breathing out with the familiar explosive sound.*

Cause. Any sort of irritation or inflammation affecting the breathing apparatus.

Treatment. (1) The cause must be found and removed; if a disease, give remedies for it. (2) Equine (horse) cough syrup, or glycoheroin in 1 ounce doses 2 or 3 times a day usually will give relief. (3) For chronic cough give Fowler's solution of arsenic as for heaves (p. 270).

In sore throat give cough electuary (p. 372). On general principles, have teeth put in

order, wet all feed, rid horse of worms, and keep stable clean and free from dust and irritating gases.

25. Roaring

A diseased condition of the larynx (upper part of the windpipe), characterized by an abnormal sound heard during the act of inhaling air. Constitutes unsoundness and is by many considered hereditary.

Symptoms. *The horse "roars" when severely exercised; may grunt when threatened with a whip; often has a chronic cough.*

Cause. Paralysis or wasting of muscles which move certain parts of the larynx. It often follows acute infectious laryngitis, strangles or pneumonia.

Treatment. Medicinal treatment is unsatisfactory. A modern operation upon certain tissues of the larynx proves helpful in a fair percentage of cases. Special surgical training, skill and experience are necessary to its success.

"Mechanical choking" from a tight collar may temporarily cause a thick-necked horse to "roar" when pulling a load up-hill. A nasal tumor (polypus), may also cause a form of roaring.

26. Congestion of the Lungs

Symptoms. *Fast, gasping breathing; sweating followed by coldness; wide, flapping, blood-shot nostrils; rapid pulse; bloodshot eyes; sometimes nose-bleed; crackling sound from lungs. A chill occurs in sub-acute attacks at the outset of a disease such as influenza (p. 275).*

Cause. Sudden engorgement of the lungs with blood, usually from overtaking an unprepared horse in driving or racing, but more or less present in cases of chill; always precedes pneumonia.

Treatment. Must be immediate and active. (1) Remove harness and stand horse in an airy place. (2) Rub strong white liniment (p. 372) on throat from ear to ear. (3) Give stimulants as in sunstroke (p. 271); or 4 drams of carbonate of ammonia in a capsule; or 1 ounce of tincture of arnica in a pint of water. (4) Hand rub and then bandage legs; blanket after briskly rubbing body. (5) After the alarming symptoms subside feed carefully for a few days in a clean, roomy, well-ventilated box stall.

27. Bronchitis

Inflammation of the lining membranes of the air passages to the lungs (bronchi).

Symptoms. *Chill, followed by fever. Full, soft, fast pulse after chill subsides. Fast breathing, the expired air hot; hoarse, painful, husky cough. Rasping and later a "moist" sound from the lungs. Rusty discharge from nostrils. Appetite poor. Persistent standing position.*

Cause. Exposure to cold or damp; inhaling of smoke or flame; foul or irritating air in badly ventilated stables, shipholds or cars. Medicine "going the wrong way" in drenching is a common and often fatal cause (p. 365).

Treatment. (1) Give the same general treatment as for pneumonia (below). (2) Apply white liniment (p. 372) to throat and chest walls. (3) Steam head with hot water from a bucket containing 1 ounce of tincture of iodine, or $\frac{1}{2}$ ounce of oil of eucalyptus. (4) Give fever medicine No. II (p. 372). (5) Follow with tonic powders (p. 372) during recovery.

28. Pleurisy

Inflammation of the membrane covering the lungs and lining the chest cavity. Caused by a broken rib puncturing or wounding the chest wall; infection, cold, exposure; or may be a complication with pneumonia.

Symptoms. *Chill, followed by fever; rapid pulse, labored breathing and acute pain. Later, stiffness, soreness; persistent standing position; elbows turned out; suppressed cough and a marked ridge on the side from elbow to upper flank during movement or pressure upon the ribs. Serum tends to collect in the chest cavity.*

Treatment. (1) Give the general treatment prescribed for pneumonia (below). (2) Relieve pain at first with a 1 or 2-ounce dose of laudanum or hypodermic injection of morphine. (3) If stiffness and soreness persist, give 2 drams of salol every 8 or 4 hours. (4) If serum gathers it should be removed by a veterinarian with a trocar and canula inserted low down, between the eighth and ninth ribs. (5) Give iron and quinine tonic (p. 372) during recovery along with nutritious feed.

29. Pneumonia (Lung Fever)

Inflammation of the active, working tissues of the lungs.

Symptoms. *Chill, followed by fever, rapid pulse, redness of mucous membranes, labored breathing, hot breath, dilated nostrils, elbows turned outward, and persistent standing position. Appetite fails, urine is scant and high-colored; feces are covered with mucus. At first, or later, a rusty discharge runs from the nostrils and the cough, when present, is deep, hollow and resonant. Normal sounds of breathing are absent from the solidified portions of the lungs.*

Cause. Pneumonia commonly is a sequel to ill-treated influenza, strangles, bronchitis, or pleurisy, especially in dirty, dark, badly ventilated stables. It may follow congestion (above). Other causes are chill from exposure to cold or when sick, weak, or warm; irritating gases; entrance into lungs of medicine or

foreign bodies; wounds puncturing the chest wall. The worst, or *gangrenous* form of pneumonia, no doubt is caused by germs and therefore is infectious.

Treatment. In all severe cases call a veterinarian to give special treatment. (1) Blanket horse and bandage legs with flannel in a comfortable, clean, well-ventilated box stall. (2) Provide pure cold drinking water. (3) Tempt appetite with a variety of food. (4) Break up chill (p. 303). (5) Rub chest with white liniment (p. 372). (6) At first give fever medicine No. I (p. 372) according to degree of fever present—later, fever medicine No. II with a strong, short-barrelled half-ounce rubber syringe. *Do not* give drenches. (7) Add 2 ounces of whiskey to each dose if patient is weak and lacks appetite. (8) During convalescence give iron tonic (p. 372).

30. Purpura Hemorrhagica

A non-contagious, febrile malady usually following a weakening disease like influenza.

Symptoms. *Purple spots appear upon the mucous membranes and great swellings of the head, legs, and floor of the abdomen occur. The swellings end abruptly as if a cord were tied about the part. The skin may crack or slough in patches and discharge bloody fluid*

which also flows from the nostrils. Fever, weakness, and lack of appetite.

Cause. Bacteria, not yet fully identified, no doubt cause the disease in horses weakened by influenza, strangles, or other sickness and especially those living in unsanitary city stables.

Treatment. (1) Place in a roomy, airy box stall. (2) Feed light, laxative mash. (3) Allow free access to cold drinking water.

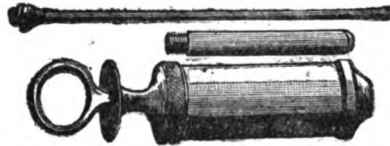


FIG. 336. Hard rubber syringe for giving medicine

(4) Constantly bathe (foment) swelling of the head to prevent suffocation. (5) Three times a day give 30 to 60 grains of quinine dissolved in 2 drams of tincture of iron together with $\frac{1}{2}$ to 1 ounce of sweet spirits of nitre in thin gruel. Increase these doses if necessary.

If possible have the horse treated by a veterinarian, as special drugs often are needed and tracheotomy (p. 385) may prove necessary.

Diseases of the Legs and Feet

The Detection of Lameness

Lameness may be a condition complete in itself, caused by pain, weakness, etc.; or a symptom of more general disease. To determine which leg is affected and how, examine the horse first in repose, then in action.

At rest. Normally the horse will stand on smooth ground squarely, on "all fours." If a front foot is "pointed" (placed forward and relieved of its share of weight) pain in that

foot is indicated; both may be lame and pointed alternately; if both are pointed at once laminitis (p. 280) is the probable cause. Severe pain may even cause one foot to be held clear of the ground. "Knuckling" or "cocking" (bending forward of the fetlock joints) when at ease and frequent shifting of the feet may denote pain but are also sometimes observed in sound animals when merely tired. The weight is always thrown on that part of the foot where the pain is least.

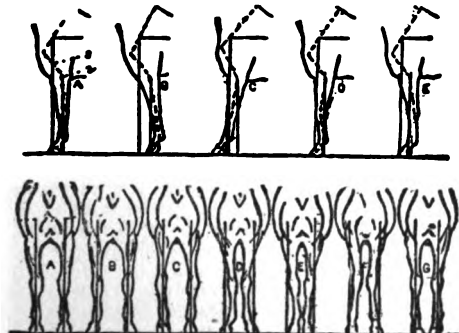


FIG. 337. Conformation of fore legs. Above from side: (dotted lines show angle of bones) *a* good; *b* legs too far under body; *c* too far forward; *d* spring knees; *e* calf leg, knees too far back. Below, from front: *a* good; *b* toes out; *c* bow legs; *d* knock-kneed; *e* type that interferes; *f* knee-hitting type; *g* toeing in, winging type

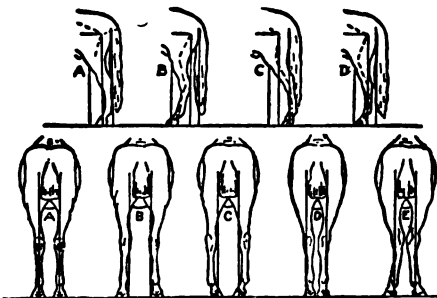


FIG. 338. Conformation of hind legs. Above from side: *a* good; *b* too far under body; *c* too far back; *d* hock joint too straight. Below from behind: *a* good; *b* too far apart; *c* pigeon-toed; *d* too close together; *e* cow-hocked type (this and Fig. 337 from Farmers' Bulletin 779).

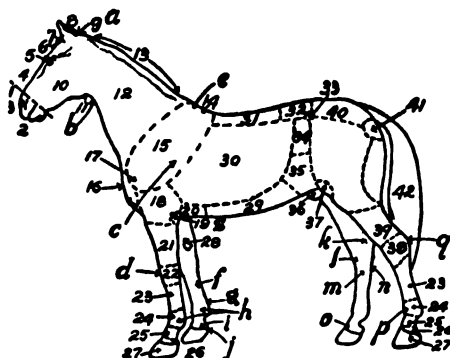


FIG. 339. Parts of the horse (numbered) and seats of common unsoundness (lettered). 1 muzzle; 2 lips; 3 nostril; 4 face; 5 eye; 6 forehead; 7 foretop; 8 ears; 9 poll; 10 jaw; 11 throat latch; 12 neck; 13 crest; 14 withers; 15 shoulder; 16 breast; 17 point of shoulder; 18 arm; 19 elbow; 20 fore flank; 21 forearm; 22 knee; 23 cannon; 24 fetlock joint; 25 pastern; 26 coronet; 27 hoof; 28 chestnut; 29 abdomen; 30 ribs; 31 back; 32 loin; 33 point of hip; 34 coupling; 35 hind flank; 36 sheath; 37 stifle joint; 38 hock; 39 gaskin; 40 croup; 41 point of buttock; 42 tail. *a* poll evil; *b* goitre; *c* sweetney; *d* sprung knee; *e* fistulous withers; *f* splints; *g* bowed tendon; *h* wind galls; *i* side bone; *j* quitter; *k* bog spavin; *m* bone spavin; *n* curb; *o* ring bone; *p* cocked ankle; *q* capped hock; *s* capped elbow.

Other signs of lameness are cracked, contracted, ringed, enlarged, flattened, steep or otherwise distorted hoofs; pasterns abnormally upright or "broken down"; tendons bowed, filled or thickened; knees bent forward; muscles wasted; shoulder straightened and leg hanging; joints swollen, crooked or puffed; sores and wounds or bulging on parts that should be straight; proofs of past firing or blistering; and any displacement of feet or joints.

In the stall. The lame horse if moved over in the stall may hop with the infirm leg; or if backed out may move with difficulty, or with a jerking of the hind legs or tail or a dragging of a fore leg indicating shoulder lameness.

In motion. Have the horse first walked and then trotted away from and toward you, with enough freedom to permit natural action. Slight lameness, not noticed at a walk may be brought out by the increased jar of the trot. Lameness in a fore leg is indicated by the horse favoring it, coming down more heavily on and nodding or "dropping" the head toward the sound one. Lameness in a hind leg causes a droop of the sound quarter and a corresponding rise of the unsound one. To aid in deciding nod the head, keeping time with the horse, as you observe his action. Sometimes lameness of a fore or hind leg causes the horse to bear extra weight on the foot diagonally opposite. It is helpful, in doubtful cases to trot the horse on soft ground and study the impressions made in it. The shallowest will be made by the lame leg or foot. Only practice and expert knowledge permit one to note the very slightest "hitch,"

"dwelling" or other characteristic motion that may locate the trouble.

Trotting the horse alternately on hard and soft ground and turning it sharply to the right or left or all the way around, often tend to bring out slight signs of deep-seated lameness.

In some cases lameness increases with work or exercise, as that from ringbone, sidebones, corns, or splints. The foundered horse becomes lamer with exercise but improves going down hill; navicular disease lameness becomes less as the horse "warms up," but increases going down hill.

Shoulder or hip lameness is suggested by swinging of the leg, dragging of the toe and difficulty experienced in stepping over obstacles.

Before making a final decision about a case of lameness, no matter how plain the symptoms appear to be, examine the foot carefully. A leather or rubber pad may cover a diseased condition while a bar shoe should always arouse suspicion as to the soundness of that member.

31. Rheumatism

Symptoms. *Pain, tenderness, stiffness, lameness of joints or muscles. Rheumatism of the neck is termed wry neck; of the loins, lumbago; of chest muscles, pleurodynia.*

Cause. Sudden change of climate; atmospheric changes; damp stables; standing in draughts; long coat of hair and sweating in stable; basement stables; poor ventilation.

Treatment. (1) Remove cause. (2) Place horse in a dry, warm box stall and blanket body. (3) Where possible, bandage affected parts with flannel after bathing with alcohol or anodyne liniment (p. 371). (4) Regulate bowels with small dose (1 to 2 ounces) of glauher salts or epsom salts in drinking water. (5) Give 2 drams of salicylate of soda or 1 dram of salol every six hours. Increase doses if necessary. (6) Blister affected parts if recovery is slow.

32. Chorea, "Crampiness," "Shivering"

An incurable nervous disorder affecting groups of muscles in the legs and constituting unsoundness. Tendency to it is hereditary. The cause is unknown but chorea is often associated with rheumatism and most commonly is seen in overgrown, tall, narrow, long-coupled horses of weak constitution.

Symptoms. *When backing out of stall a hind leg spasmodically jerks up, the tail elevates and quivers, and muscles of the flank twitch. All symptoms then cease, but return after rest. May appear when horse makes a sharp turn or starts to drink water. Not seen when moving forward. The disease grows worse with age. When fever is present from any cause, the*

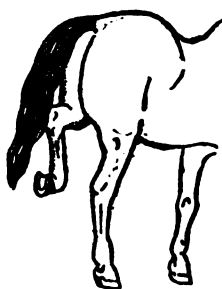


FIG. 340. Stringhalt

horse becomes stiff in all fours and the joints "crack" when moved.

Treatment. Medicinal treatment fails, but a colt may improve if well fed and allowed to run out as much as possible.

33. Stringhalt

Akin to chorea and by some considered hereditary. Constitutes unsoundness. Cause is unknown.

Symptoms. During action there is constant, violent, spasmodic jerking up of one or both hind legs. Sometimes affects a fore leg. Grows worse with age, hard work, or injury.

Treatment. The operation of *peroneal tenotomy*, for the removal of a piece of tendon at a point on the outside of the leg just below the hock, succeeds in a fair percentage of cases. Conclusive results should not be expected sooner than 4 or 5 weeks after the operation.

34. Dislocation of Knee Cap (Patella)

Slipping out of place of the knee cap of the stifle joint, a condition termed "stified" by horsemen, generally caused by a sudden slip or change of position. Weakness of muscles in fast-growing colts sometimes causes the knee cap to slip out of place and back again with a snapping noise as the animal walks.

Symptoms. In complete dislocation the hind leg is straightened, thrust backward and cannot be advanced.

Treatment. The patella may snap into place if the horse is suddenly scared with a whip or moved backward and to the side. If these measures fail bring the hind foot forward and upward and press the patella into place by hand. Then blister the stifle and rest the horse for 3 or 4 weeks. For partial dislocation: (1) Tie the colt short in a stall. (2) Keep the foot of the affected leg somewhat advanced under the body by means of a padded rope or strap fastened to a wide strap round the pastern and then run forward between the fore legs and tied to a collar. (3) Blister the stifle and around it and keep the colt tied up for a month.

Disease of the stifle joint, with chronic lameness, requires a special shoe, rest, repeated blistering, or firing and blistering by a veterinarian. Dropsical swelling of the stifle with lameness in a young colt commonly is due to infection of the navel and is incurable. Otherwise it may be outgrown. Treat as for bog spavin (p. 285) without lameness.

35. Curb

An enlargement giving a bulging appearance to the outline of the back of the hock joint. (Fig. 341.) Caused by a sprain of certain important ligaments of the hock joint involving, in chronic cases, other tissues of the part, even including the bone.

Symptoms. Viewed from the side the outline of the back of a normal, sound hock joint is straight. A curb occurs as a bulging lump or "bunch" upon this part. If recent it is rounded and may be soft.

If old and organized, the enlargement is wider spread and may be bony in character. Lameness usually is present during the inflammatory stage but tends to subside in time, if rest is allowed. "Sickle" hocks are most susceptible to curbs.

Treatment. (1) Rest. (2) Apply cold, wet packs, or poultices of antiphlogistine, or pipe clay. (3) Paint with tincture of iodine. (4) Blister if lameness persist. (5) Fire and blister as a last resort.

Where a small curb is present, without lameness, it may be removed in time by rubbing firmly downward upon it for 5 or 10 minutes several times a day by means of a flat bone or piece of smooth hardwood and at night painting the lump with the following mixture: tincture of iodine 2 ounces; turpentine 1 ounce; alcohol 3 ounces.



FIG. 341. Curb (b). Point of hock at a

36. Bone Fractures

A fracture is a break in a bone due to an accident. It may be (1) *simple*, in which the bone is broken in two without causing a surface wound; (2) *compound*, causing a surface wound; (3) *comminuted*, in which the bone is smashed to pieces; (4) *complicated*, in which a joint or important organs are involved; (5) *green stick*, a cracking or incomplete break; (6) *impacted*, in which one fragment of bone is driven into another.

Types (2), (3), and (4) offer little chance for successful treatment, and fractures of the following bones are practically hopeless: back, thigh (*femur*), leg (*tibia*), arm (*humerus*), forearm (*radius and ulna*), shoulder blade (*scapula*) if through neck of bone, and shin bone (*cannon*) except in foals. Fractures of pastern bones are worth treating in valuable breeding horses. Simple fractures of the ilium and ischium of the pelvis (Fig. 321) generally "mend" successfully. The leg bone (*tibia*) is most commonly fractured. Often it is merely cracked; if this is suspected, tie the horse up and support with slings for at least 3 weeks. If it is exercised the

fracture will become complete and the animal will have to be destroyed.

Symptoms. *Horse takes weight off injured leg. Pain, heat, and swelling of part. Ends of broken bone grate when moved.*

Treatment. (1) Give absolute rest to fractured part after bringing ends of bones perfectly together, and holding them there with splints or special braces, plaster of Paris ("dental plaster") bandages and casts, (p. 366), or Burgundy pitch bandages (p. 366). (2) Support animal with slings, or (3) In fractures of pastern bones, give liberty in box stall bedded with sawdust or shavings. Splints are made of metal, light wood, gutta-percha or sole leather according to the animal and part to be treated. Repair of a fracture requires from 6 weeks to 3 months.

37. Founder (Laminitis)

An inflammation of the sensitive leaves (*laminae*) of the feet which may be acute or chronic. Affects most severely the fore feet.

Symptoms. *Chill, then fever and acute pain. Full, bounding pulse. Difficulty in backing.*

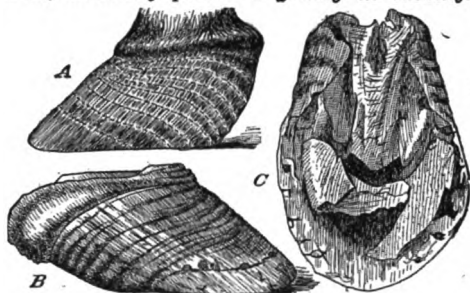


FIG. 342. Severe cases of founder. B and C views of same foot very badly affected (Diseases of the Horse, U. S. Department of Agriculture).

Fore feet extended and resting on heels; hind feet correspondingly advanced. Acute symptoms may continue for 4 or 5 days. After 10 or 12 days, if not relieved, the soles of the feet tend to "drop," the condition then becoming chronic and incurable.

Cause. Indigestion. Irritation of the lining membrane of the digestive tract from any cause. It may come from excessive concussion upon hard roads, gorging on feed, drinking cold water when hot and tired, or follow a weakening disease such as influenza. "Colt founder" is due to infection of the womb following foaling.

Treatment. (1) Remove shoes, but do not pare feet, and turn into a deeply bedded box stall. (2) Apply to the feet cold, wet packs of oakum or cotton and bandages. Keep them constantly wet. Encourage lying down. (3) Give a dose of raw linseed oil to move bowels, except in hot weather. (4) Give 2 to 4 ounces of saltpeter in water 3 times a day. Alum in half

these amounts also is effective. (5) Blister the hoof-heads of the fore feet at intervals of two weeks if lameness persist after 10 days. (6) Shoe with flat, wide-webbed, low-heeled bar shoes.

In *chronic founder* do not pare the dropped soles, but cover them with thick leather pads and put on the bar shoes already mentioned. A horse so shod may work on soft land. In *colt founder*, swab the womb with absorbent cotton soaked in a 2 per cent solution of permanganate of potash or other antiseptic, and give local and internal treatment as for acute founder.

38. Sprains

Injuries to muscles, tendons, ligaments, or joints resulting in rupture, over-stretching, tearing or lacerations of their tissues. Caused by a violent slip, wrench, twist, fall, or similar act.

Symptoms. *Heat, pain, swelling, and lameness of part affected.*

Treatment. (1) General requirements: Rest; soothing applications at first; pressure; massage; stimulating liniments, blister, or firing and blistering later. (2) In sprains below the knee, apply cotton batting thickly, bandage to keep cotton in place then put on another bandage firmly for pressure. Some use hot water at first and cold water when inflammation subsides. (3) In severe injuries of tendons, or breaking down of the fetlock joint, a plaster of Paris ("dental plaster") cast is advisable (p. 366) with blistering or line-firing and blistering (p. 383) to strengthen the parts after inflammation subsides. (4) In sprain of the shoulder or hip, a blanket wrung out of hot water should be applied and kept wet with hot water for 12 hours or more; then apply anodyne (pain checking) liniment and later stimulating liniment (p. 371) or a blister.

Allow all lame horses a box stall bedded with sawdust or planing mill shavings. In severe injuries of the hind legs, support the horse with slings.

39. Sweeney ("Shoulder Slip")

Symptoms. *Lameness at first in severe cases, followed by wasting away (atrophy) of the muscles so that the spine of the shoulder blade (scapula) becomes prominent.*

Cause. Pressure on, or injury of the front shoulder blade nerve resulting in a wasting away of the shoulder muscles it supplies. Most commonly caused by the collar when a colt is plowing for the first time.

Treatment. (1) Rest. (2) Apply hot pack to ease pain. (3) Massage frequently and persistently when inflammation subsides. (4) Rub with "white liniment" (p. 372). (5) Blister (p. 371) if necessary.

If wasting persist a veterinarian can inject

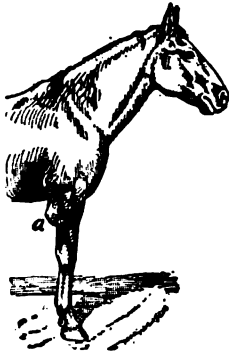


FIG. 343. Shoe boil at a

tincture of iodine under the skin at several points at the top of the wasted part and then work it downward by rubbing. The "sweenied" horse should be well fed and have active exercise daily. In old cases of supposed sweeney the wasting may be due to chronic foot lameness.

40. Shoe Boil

A sac or cyst filled with serum (colorless or pinkish fluid) occurring at the point of the elbow and caused by a bruise from lying on the elbow. May later become a hard tumor. Shoe usually considered cause.

Symptoms. Heat, swelling, pain, and formation of a fluid-filled sac on point of elbow if bruise is severe. Lump may develop without acute symptoms; later it becomes hard (fibroid) and may discharge pus.

Treatment. At outset of a new case do not open cyst but (1) Keep horse tied up to prevent lying down. (2) Foment with hot water. (3) When inflammation subsides, paint lump with tincture of iodine daily. The serum may be reabsorbed into the body but if pus forms it must be let out. A fibroid (hard) shoe boil should be removed by operation.



FIG. 344. Capped hock

40a. Capped Hock

A condition of the hock similar to shoe boil of the elbow, also due to bruising (Fig. 344). It tends to become well developed, hard and permanent. **Treatment.** (1) Remove cause. (2) Rest. (3) Apply cold wet packs, or poultices of antiphlogistine or pipe clay and vinegar. (4) Apply tincture of iodine, or bathe repeatedly with a weak solution of concentrated lye. Do not apply a blister. A trained veterinarian may operate with success.

41. Splints

A bony growth developed between the splint bone and cannon bone of the leg (Fig. 347). Most common on inner side of fore leg, in horses under 6 years old. The result of inflammation of bone skin



FIG. 347. Splints at a; bad quarter crack at b (Wisconsin Bulletin 127)

(periosteum) caused by strain or severe concussion such as heavy shoes or hard roads.

Symptoms. Lameness at trot, increasing with exercise, disappearing with rest. Bony growth appears on course of small splint bone.

Treatment. (1) Give absolute rest. (2) Apply hot packs if pain is present; otherwise cold. (3) Later rub and swab with lotion prescribed for curb (p. 279). In obstinate cases have veterinarian fire in deep points upon the splint by means of a thermo-cautery; this is much superior to blistering.



FIG. 345. Cocked ankle

42. Knuckling or Cocked Ankle

Cause. Thickening and shortening of the tendons due to sprain, over-feeding and standing on board floors; or hard work or disease.

Treatment. A young foal may outgrow the condition. If not, hand rub the parts twice daily, force the joint backward, apply an ankle boot or special brace made by the blacksmith, and keep it in place by bandages or wide buckle straps. If the foal goes on front of hoof, a special shoe with a long turned-up toe must be put on. In an adult horse chronic knuckling is remedied by the operation of tenotomy, or severing of the tendons, which can be done only by a trained surgeon.



FIG. 346. Ring-bone

43. Ring-bone

A bony deposit occurring upon the large or small pastern bones, constituting unsoundness. "High ring-bone" affects the pastern joint; "low ring-bone" the joint between the small pastern and coffin (pedal) bones; "false ring-bone" the bone between joints. Tendency to it is considered hereditary.

Symptoms. Severe lameness when a joint is involved. A bony enlargement usually is found on the part affected, but lameness may come first. Lameness of a fore foot is most acute, especially on hard ground. Ring-bone of a hind foot often causes the horse to take long steps and go on its heels. A small ring-bone may cause severe lameness, while lameness may not accompany a large ring-bone, or one that is forming.

Cause. Sprain of ligaments; injury; fractures; infection. Inflammation of bone skin precedes the

bony deposit. An assisting cause is an unlevel hoof; also high, upright pasterns tend to high ring-bone, and long, sloping pasterns to low ring-bone.

Treatment. (1) Give absolute rest and continuous cold, wet applications (felt or swabs of cotton waste) when ring-bone is forming. (2) Remove hair and blister repeatedly (p. 371) the part if simpler measures fail. (3) Have veterinarian combine puncture firing and blistering if lameness develops. High unnerving and a rolling motion shoe are called for in chronic ring-bone lameness of a fore foot.

44. Sidebone

A changing to bone (ossification) of the side gristles (cartilages) which prolong the wings of the coffin (pedal) bone of the fore foot (Fig. 348), constituting unsoundness. One or both cartilages may be involved, either throughout their length or only at the lower portion. Draft horses are most commonly affected. Tendency to side bones is hereditary.



FIG. 348.
Sidebone

Symptoms. Lameness may be absent, slight or acute. In lameness the strides at the trotting gait are short and the feet land on their heels. Lameness gets worse with exercise, especially upon hard roads. Shoe wears unevenly. Horse "points" foot at rest. A bony enlargement is present on the hoof-head toward the heel, where the flexible cartilage would normally be found.

Cause. Lack of frog pressure due to high heels (calkins); unlevel shoeing; injuries. Wide, low heels and flat soles increase tendency to side-bones.

Treatment. Where lameness is not present: (1) Rest. (2) Remove shoes, shorten toe and level heels. (3) Keep cold, wet swabs on hoof-heads. If lameness is present: (1) Rest. (2) Put on bar shoes. (3) Have veterinarian line-fire hoof-head and hoof below the side-bone. (4) Unnerve (p. 388) as a last resort.

45. Quittor

Enlargement of the hoof-head and formation of a chronic running tract connecting with diseased gristle. Caused by quarter crack (47 below); suppurating corn; nail prick; bruise of the coronet.

Symptoms. Lameness. Enlargement of the hoof-head, commonly at the quarter, and formation of one or more sinuses or fistulous tracts discharging pus.

Treatment. (1) Clip hair from hoof-head and cleanse it and hoof. (2) Shorten toe and pare sole and frog clean; (3) Open up suppurating corn or nail prick if found. (4)

Scrape out dead tissues through sinus by means of a curetting instrument (Fig. 367) (5) Inject a solution of one dram corrosive sublimate in an ounce of water containing about 20 drops of hydrochloric acid in obstinate cases. (6) Apply cold, wet swabs to hoof-head for one week. (7) Then inject caustic solution again and blister the hoof-head (p. 371). Have a trained veterinarian do the operating and direct the subsequent treatment.

46. Contracted Hoof

Symptoms. Hoof becomes steep, high at heels, narrow and dry. Frog shrinks. Gait stilty or "groggy" at first, but may become normal with exercise.

Cause. Lack of moisture; standing on dry board floors; lack of exercise; leaving shoes on too long; rasping wall, cutting away sole, bars and frogs; "opening" heels; applying red hot shoes; long toes; foot lameness; navicular disease.

Treatment. Prevention by removal of

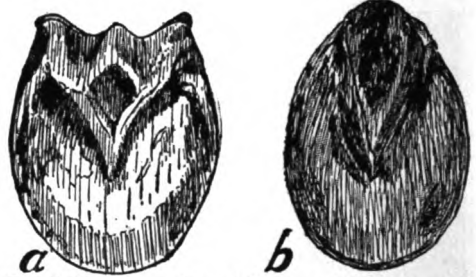


FIG. 349. Bottom of sound but somewhat flat foot (a); and of badly contracted foot (b)

causes is important. Have foals born in spring; fall colts are subject to contracted hoofs. Trim feet often. Don't confine in box stall. Allow exercise on moist ground. (1) Trim hoof to proper proportions; shorten toe and level bearing surface. (2) Then keep cold, wet packs on hoof-heads; or (3) immerse in cold, soft water for hours daily and apply any simple greasy hoof dressing; or (4) turn horse barefoot on low moist pasture. (5) Clip hair from hoof-heads and apply a blister (p. 371) after a month of moisture treatment.

47. Split Hoof

A crack in wall of hoof running from the hoof-head downward. If at the toe, called "sand crack," if at side of foot toward heel, "quarter crack" (Fig. 347).

Symptoms. Lameness may or may not be present. The crack may bleed during motion. Infected cracks ooze pus and often cause quittor.

Cause. Drying out and contraction of the hoof from rasping the walls and cutting

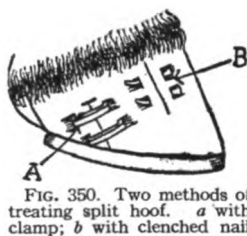


FIG. 350. Two methods of treating split hoof. *a* with clamp; *b* with clenched nail

away soles, bars, and frogs; standing on dry, board floors; un-level hoof; errors in shoeing. Cracks at ground surface of wall are not serious. Sand crack often incurable, is usually caused by the toe clip of the shoe.

Treatment. If recent (1) Clinch crack with nail, or plate and screws. (2) Soak foot in cold, soft water for hours daily; then apply cold, wet swabs. (3) Blister hoof-head and turn on low pasture.

In a chronic case of *quarter crack* causing lameness and with pus present (1) Cleanse crack and remove pus, foreign bodies and under-run horn (horn separated by burrowing of pus). (2) Swab wound with tincture of iodine. (3) Burn a line almost through wall across crack at juncture of wall and hoof-head. Then burn a large V in the hoof-head (coronet) with point of V resting on line at top of crack. (4) Blister hoof-head. (5) In two weeks put on a flat bar shoe after removing a semi-circular portion of the wall at the ground surface under the crack and turn horse on low pasture. Shoe, if preferred, before firing. (6) Repeat blister two or three times at intervals of three weeks. The firing is best done by a trained veterinarian.

Treat a *sand crack* by (1) Cutting away a semi-circular portion of the wall at the ground surface of the toe. (2) Putting on a rolling motion bar shoe with two side toe clips. (3) Closing the crack with a nail clinch after cleansing; and (4) Firing as for quarter crack.

48. Corns

Injuries, involving the sensitive sole, or laminae, or bars of the hoof at the heel. Of three kinds: (1) Dry, or red (hemorrhagic). (2) Moist, or superficial. (3) Pus-forming or suppurative.

Symptoms. *Lameness, slight or severe, increasing with exercise. "Pointing" of lame foot. Flinching when shoe is tapped at heel with hammer. In suppurating corns pain is intense before pus breaks through at hoof-head. Horse pants, sweats, refuses to eat and holds foot off ground. Pus flows when seat of corn is opened up. In a chronic case of ordinary corns the horse stumbles, stubs his toes, takes short steps and is "sore footed."*

Cause. In red corns bleeding of the sensitive laminae, between heel and bar, has occurred from straining, and the part is dry. In superficial corns the outer tissues, from bruising, have become soft and ooze a fluid. In suppurative corns pus has formed, from bruising and infection, and deep tissues are in-

volved. Direct causes of corns are: Un-level shoeing and paring inner heel low; failure to reset the shoes so that they are dragged forward and bruise the seat of the corns; cutting away the bars and frogs and "opening" the heels so that the hoof contracts. "Gravel" does not cause corns.

Treatment. For *dry corn*: (1) Remove shoe. (2) Shorten toe. (3) Level foot. (4) Slightly pare corn and cover with leather to build up low inner heel. (5) Put on flat shoes; and (6) keep cold wet packs on hoof-head for 3 or 4 weeks; or turn horse out bare-foot on low, wet pasture. For *moist corn*: (1) Trim entire hoof. (2) Cut away all loose and under-run horn. (3) Swab with a 1-1000 solution of corrosive sublimate. (4) Apply daily a dry dressing powder (p. 372), covered with absorbent cotton and clean bandages.

Suppurative corn is a very serious condition and should be operated upon by a skilled surgeon who will render the foot insensitive by injecting a cocaine or eucaine solution upon the nerves, and then strip away all under-run horn, including that of the wall at the heel, remove all dead and diseased tissues, lightly cauterize exposed parts and apply antiseptic packs.

A three-quarter plate or bar shoe may be put on after successful treatment of moist and suppurative corns.

49. Thrush

A disease causing the breaking down of the horn of the frog accompanied by a foul-smelling discharge. Caused by wet and filth in the stable; lack of pressure, from contraction of the heels and shriveling of the frog; navicular disease (p. 284).

Symptoms. *The cleft of the frog, which naturally is shallow, becomes deep and discharges a thin bad-smelling pus, which tends to undermine the frog and sometimes the sole. Lameness rarely is present. The hind feet most commonly are affected.*

Treatment. (1) Shorten the toe and trim the hoof to cause pressure upon the heels. (2) Cut away all rotten or under-run horn

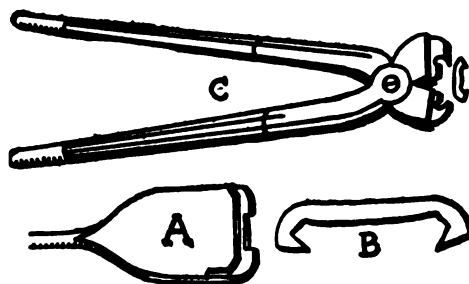


FIG. 351. Implements for treating split hoof. *a* iron for burning groove; *b* clamp; *c* clamping iron

of the frog or sole. (3) Cleanse perfectly the cleft of the frog and on each side of it. (4) Pack it with calomel held in place by means of oakum, pine tar, and bandages so as to cause pressure. (5) Renew the dressing in a week. (6) Keep the stall clean, dry, and bedded with planing mill shavings or sawdust.

50. Nail Prick

Symptoms. *Slight punctures may not cause lameness. Puncture by a sharp or dirty nail deep into the foot causes serious injury or infection and burrowing pus with acute pain and severe lameness. Horse stands on toe or holds foot off ground. Foot hot and sensitive. Coronet sometimes swollen. Pus may break out there or above heels, or a quittor form (p. 282).*

Cause. Loose shoe partially pulled off and stepped upon. Upright nail in board. Nails lodging flat in cleft of frog or at side of frog, later tipping up and causing puncture. Nail driven into "quick" at time of shoeing.

Treatment. (1) Pare entire sole; cleanse and scrub with soap and hot water. (2) Expose wound perfectly by paring away sole or frog. (3) Saturate wound with tincture of iodine or a 1-500 solution of corrosive sublimate. (4) Cover wound with antiseptic powder (p. 372), absorbent cotton or oakum and bandages to cause pressure. (5) Renew dressing daily. Horse should occupy a box stall bedded with sawdust or shavings.

When a nail has pricked the quick as indicated by lameness, (1) Remove shoe and cleanse hoof. (2) Open up nail hole. (3) Cut through the wall to seat of injury, liberating black fluid or pus. (4) Cleanse wound and immerse foot for 10 minutes in a 1-1000 solution of bichloride of mercury or in water containing a tablespoonful of coal tar disinfectant to the quart. (5) Cover with antiseptic powder, absorbent cotton and a clean bandage. (6) Renew dressing daily.

In all severe cases employ a skilled veterinarian as special operations often are necessary. He should also immunize the horse against tetanus (p. 270) by giving a 10 cubic centimeter hypodermic injection of tetanus antitoxin.

51. Navicular Disease

A chronic inflammation of the shuttle bone (navicular bone) of the fore foot, sometimes involving the flexor tendon and the sac supplying the navicular bone with lubricating fluid.

Symptoms. *Stumbling. Stubbing toe in ground. "Pointing" foot forward when at rest. Horse usually walks sound. On trotting, lameness is severe but commonly disappears with exercise. Hoof is dry and contracted. Toe of shoe wears thin.*

Cause. Rheumatism; concussion from over driving a young horse upon a hard road.

Narrow, steep, contracted hoofs cause a tendency to the disease, as do upright pasterns and long toes.

Treatment. If given at outset of disease may effect a cure. (1) Remove shoes and shorten toe and level foot. (2) Turn horse into a box stall. (3) Keep cold wet packs on the hoof-head for 2 or 4 weeks, then blister (p. 371). (4) After blister has been washed off, apply wet swabs again for 3 weeks. (5) Then put on a rolling-motion or rocker shoe. In chronic navicular disease the only recourse is unnerving (p. 388) to be done by a skilled surgeon.



FIG. 352.

Bone spavin (on inside of hind leg, viewed from rear).

52. Bone Spavin

A bony growth, caused by disease, that forms upon the bones of the inner, lower part of the hock joint (Figs. 352-3).

"Occult" or "hidden" is the term applied to an unseen spavin occurring as an ulceration of the surfaces of the bones of the hock joint. Spavin constitutes unsoundness and the tendency to it is hereditary.

Symptoms. *A hard, bony knob or lump at the seat of spavin. If lameness is present the horse "moves over" and backs out of stall lame, goes lame for some distance and then "warms out" of lameness. Toe of shoe is worn down.*

Cause. Weak hocks; sprain, strain and compression causing inflammation of the bone skin of the bones involved.

Treatment. When lameness is marked the most effective treatment is firing and blistering (p. 383) followed by absolute rest, the horse being tied up short in his stall for 6 weeks. In obstinate cases the veterinarian

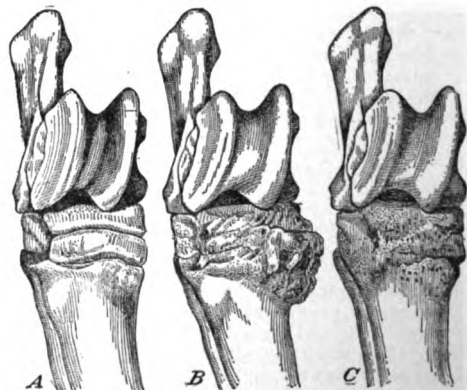


FIG. 353. What happens to the bone in spavin. a sound hock joint; b case of spavin; c cured case of spavin (Diseases of the Horse).



FIG. 354.
Bog spavin

may perform the operation of *cunean tenotomy* before giving treatment.

53. Bog Spavin—Thoroughpin—Wind Galls

Bog spavin is a soft swelling at the front and inner side of the hock joint due to an excess of joint oil (*synovia*). Caused by over-feeding and lack of exercise in draft colts; infection of the navel at birth; sprain; injury. A tendency to it is hereditary.

Symptoms. *Lameness commonly absent unless condition arose from navel infection, or injury. A bone spavin associated with bog spavin also causes lameness.*

Treatment. Colts tend to outgrow simple bog spavin, but their improvement may be hastened by pasturing them after covering the joint with pine tar. Massage and apply pressure from a truss. Applications of iodine tincture or absorbent lotion (p. 371) help. Firing and blistering are called for when lameness is present; but lameness from ulceration due to infection is incurable.



FIG. 356.
Thoroughpin

Wind galls are distensions of tendon sheaths with lubricating fluid. They rarely cause lameness when formed but are practically incurable. Hand rubbing and pressure from bandages help for a short time.



FIG. 355.
Wind gall

Thoroughpin, commonly associated with bog spavin, is of the same nature but the bulging or "puff" is at the sides of the hock toward the rear and can be pressed from one side to the other. Treat as for bog spavin.

Parasites and Skin Diseases

54. Worms

Horses are most commonly infested by these three kinds of worms: 1. The *Round Worm*, yellowish white in color and about as thick as a lead pencil. The male measures 8 to 10 inches and the female 10 to 12 inches. It inhabits the small intestines and lives on feed eaten by the horse. 2. The *Blood*, or *Palisade Worm* which is whitish brown or red in color, the size of a small darning needle and blunt at one end,

like a little shingle nail. The male is from 1 to 1½ inch in length and the female 1½ to 2 inches. It inhabits the large intestines and is a blood sucker. 3. The *Pin Worms* of 2 kinds: (1) One is whitish in color and rather thick in body. The male is from ½ to ¾ of an inch in length and the female 1 to 1½ inch. (2) The other is similar in size, shape, and color to (1), but the female is from 3 to 4 inches in length and the male ½ to ¾ of an inch. Both inhabit the large intestines and rectum and are not blood suckers.

Symptoms. In general those of chronic indigestion (p. 272), but in addition a scaly or dandruff-like substance and streaks of mucus are seen about the anus of the "wormy" horse. Worms may also be found in the feces. Colts infested with blood worms are pot-bellied, weak and "wobbly" and often die. The mucous membranes of the eyelids, nostrils, and mouth are pale. These worms also cause dilations (aneurisms) of the arteries supplying the small intestines, which frequently cause colic in the adult horse; or they may rupture and cause death from bleeding. Pin worms cause tail-rubbing and stamping or kicking in the stable.

Cause. Worms grow from eggs passed in the feces and scattered about pastures and in feed and drinking water. Permanent pastures long grazed by horses and, especially, low, wet fields are fertile sources of intestinal parasites and young colts should be kept off them. Also avoid dirty watering troughs, pond water, marsh hay, and old, weathered corn fodder.

Treatment. Round Worms. (1) Give an aloes ball (p. 367) after due preparation. (2) Mix in damp feed night and morning for a week 1 tablespoonful of a mixture of equal parts dried sulphate of iron and sulphur, and 2 parts of salt. (3) Discontinue the medicine for 10 days. (4) Give the powders for 1 week as before. Omit iron for a pregnant mare, as it possibly might cause abortion. Oil of turpentine also is effective but cannot safely be given to pregnant mares. The dose is 1 to 2 ounces shaken up in 1 to 2 pints of raw linseed oil and given after starving the horse for 18 hours or more. Give colts smaller doses of these medicines, according to age and size.

Blood Worms. There is no specific remedy; prevention is all-important. Avoid old contaminated pastures and feed growing colts generously. Allow them free access to a mixture of 3 parts of salt and 1 part each of dried sulphate of iron, sulphur, and powdered gentian root. If colts become in-

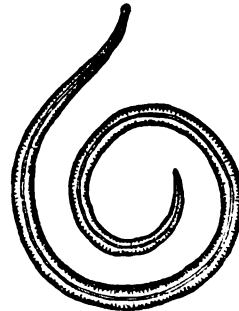


FIG. 357. Round worm of the horse

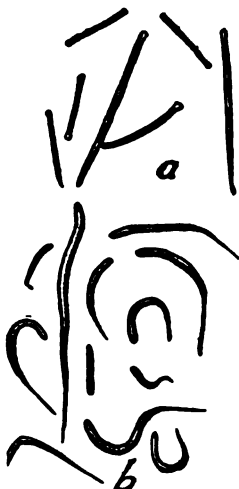


FIG. 358. Blood worms *a* and pin worms *b* of horse

infested give twice daily a heaping teaspoonful of the powders prescribed for round worms. Feed milk, gruels, and raw eggs in addition to ordinary foods.

Pin Worms. (1) Give treatment for round worms above. (2) In the evening inject into the rectum 3 to 4 quarts of soapy warm water containing a cupful of tobacco tea made by steeping tobacco stems or leaves in boiling water. (3) Repeat the injections 3 times at intervals of 2 days. A decoction of 4 ounces of quassia powder or chips to a gallon of boiling water also is effective; some horsemen use salty warm water.

55. Bots

These are the grubs or *larvae* of the horse bot-fly or gad-fly (Fig. 359) and are present in the stomach of practically every horse that has pastured grass. The female cements her eggs to the hairs of the horse's jaws, chest and fore legs. The grubs hatch from the eggs in 3 weeks and when licked off and swallowed enter the stomach and cling to its walls by small hooks, remaining there for 10 months, absorbing food from its mucous lining. Unless numerous they may cause little apparent discomfort. They rarely cause colic and do *not* cause rupture of the stomach. Occasionally they have been known to cause ulcers, or hook into the lining of the rectum and cause irritation, or block the exit of the stomach. In some instances their presence is indicated by the symptoms of chronic indigestion (p. 272).

Treatment. Bots resist almost every drug that can safely be given. The most recent treatment is to give an aloes ball (p. 367) after due preparation and when it has ceased to operate give at 6 A.M. 2, or at most, 3 drams of carbon bisulphid in a gelatine capsule and repeat the dose at 7 and at 8 A.M. This is for an adult horse; give a yearling half as much bisulphid.

Prevent bots by singeing off the hairs to which eggs stick, or destroy the eggs by applying a mixture of 1 part of kerosene and 2 parts of raw linseed or cottonseed oil, or a 5 per cent solution of carbolic acid or coal tar dip. When bots cause irritation in the rectum inject soapy, warm water containing a decoction of tobacco leaves or stems.

56. Ringworm

A contagious skin disease caused by a vegetable parasite or fungus which also lives on damp walls and woodwork.

Symptoms. Round, hairless scabby patches with raised, inflamed borders appear upon the skin on various parts of the body. There is little or no itching.

Treatment. (1) Scrub the spots clean. (2) Apply an ointment of 1 part of salicylic acid and 6 parts of lard as often as necessary. Iodine ointment also is effective. In obstinate cases paint with tincture of iodine twice daily. The stable should be cleansed, disinfected, whitewashed, well lighted and ventilated. Harness and clothing should also be cleansed and disinfected.

57. Lice

Horses are infected by two varieties of lice: *Hematopinus macrocephalus*, which has a long, narrow head and large body and lives by biting and sucking blood from the skin; and *Trichodectes pilosus*, which is much smaller and has a rounder, broader head. It lives chiefly upon the outer layer of the skin. Both lice deposit eggs or nits which are cemented to the hairs and passed from one animal to another by contact. Chicken lice or mites also irritate the horse but die in 2 or 3 days.

Symptoms. Infested horses rub against fences, posts, and buildings. The skin of the tail and under the mane is commonly infested.

Treatment. (1) Clip and singe the horse. (2) Wet infested parts as necessary, with a decoction of (a) 1 ounce of stavesacre or larkspur seeds and a quart of boiling water, (b) one ounce of strong tobacco in a pint of water, or (c) an ounce of coal tar dip in a pint of water. (3) If cold weather prevents the use of a liquid, dust the infested parts freely with pyrethrum powder or flowers of sulphur. (4) Destroy chicken lice on horses with the tobacco decoction or dip solution mentioned above and keep poultry out of the horse stable.

58. Mange

True parasitic mange of the horse which is highly contagious and hard to cure is com-

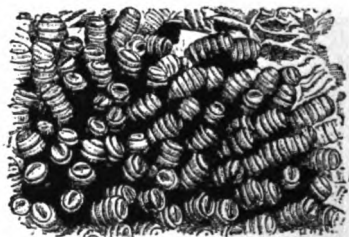


FIG. 359. Piece of the stomach wall of a horse showing bots or grubs of the gad-fly attached to it

paratively rare. Often a simpler disease or cause of irritation is present.

Symptoms. *Itching causes rubbing and the formation of crusts and scales on the skin of the affected parts. Other horses quickly become infected. Certain proof is supplied by microscopic examination if the right parasites are discovered.*

Cause. Very small parasites or mites of three families, viz.: 1. *Sarcoptes*, 2. *Psoroptes*, and 3. *Symbiotes*. Of these the *sarcoptes* form is most common and destructive. Infected horses, stables, and stable utensils, horse clothing and harness, are the chief sources of the disease.

Treatment. (1) Put horse by himself and clip him. (2) Scrub affected parts with a warm solution of 1 ounce of coal tar dip to a pint of water, or decoction of 1 ounce of strong tobacco in a pint of boiling water. (3) Repeat in 2 or 3 days. (4) Afterward apply every 3 or 4 days a mixture of 2 ounces of sulphur, 1 ounce of coal tar dip and 1 pint of cottonseed oil.

Cleanse, disinfect, and whitewash the stable. Burn old bedding and loose trash. Put all stable utensils in boiling water then in a 5 per cent solution of coal tar disinfectant. Sponge harness with a similar solution.

59. Summer Sores

These occur in summer, dry up in winter, but appear the next season. They are considered parasitic in origin. "Jack sores" are of similar nature.

Symptoms. *Large circular itching sores form upon the legs or other parts of the body and tend to spread. They are covered with a soft, pulpy layer. Very small boil-like lumps from which pus can be squeezed commonly accompany the large sores.*

Treatment. (1) Tie horse short. (2) Smear lard around sore and then rub on it a very small amount of powdered yellow sulphuret of arsenic (orpiment). (3) Remove the sloughing scab when it loosens, then dust the sore once daily with iodoform. (4) Cover sore with absorbent cotton and a bandage.

Great care must be taken in using the arsenic powder for if too freely applied it will cause unnecessary sloughing and an unsightly scar; also in keeping the horse tied so he will be unable to lick or bite the sore. Fowler's solution of arsenic (p. 367) given in maximum doses is useful in obstinate cases. Many veterinarians cut out or puncture-fire such sores.

60. Eczema—"Summer Itch"

Inflammation of the skin with formation of blisters, caused not by a parasite but by a sudden change from dry feed to grass; feeding heavily on corn in summer or feed-

ing new oats and new hay; heat and sweating; lack of grooming; imperfect shedding of hair; and insanitary stabling.

Symptoms. *Very small blisters filled with thin fluid form on the skin of any part of the body, burst, dry and form scabs which may leave hairless spots. The horse rubs and bites the affected parts.*

Treatment. (1) Stop feeding green grass, corn, or new oats or hay. (2) Clip coat, if long. (3) Clean up and disinfect stable. (4) Wash affected parts with a solution of 1 teaspoonful of coal tar dip to a pint of water, then rub in flowers of sulphur. (5) Mix 1 tablespoonful of granular hyposulphite of soda in the feed night and morning.

In chronic cases give $\frac{1}{2}$ ounce of Fowler's solution of arsenic night and morning and apply iodine ointment 2 or 3 times a week. Irritation often may be allayed by applying a lotion of $\frac{1}{2}$ ounce of granular hyposulphite of soda and 20 grains of menthol in a pint of soft water.

Mallenders is a form of eczema affecting the skin at the back of the knees and *Salenders* a like unhealthy condition of the skin in front of the hocks. It most commonly affects fat, sluggish, overfed and under exercised heavy draft horses. The skin cracks open, fluid leaks out and scales and scabs form. The hair of the part is rough and erect.

Treatment. (1) Give steady work or abundant daily exercise, less rich feed, thorough grooming and sanitary stable conditions. (2) Rub in a little oleate of mercury daily. Do not wash the parts.

61. Scratches, Cracked Heels

Symptoms. *The skin at the back of the pasterns becomes red, swollen, and chapped. Later it hardens and cracks where wrinkles form when the joints bend. A slight discharge may come from the affected parts, but in simple scratches this has no foul odor, nor do the cracks spread above the fetlock. The discharge may dry into bran-like scales.*

Cause. Failure to dry the skin after wetting or washing; exposure of wet skin to cold draughts; sweat running down and drying on the pasterns. White skin, soiling readily, is most often washed and therefore most subject to scratches, if not properly dried.

Treatment. (1) Poultice with hot flaxseed meal for 2 days. (2) Then apply twice daily an ointment composed of spirits of camphor 2 drams, flowers of sulphur $\frac{1}{2}$ ounce, lard 4 ounces. Washing aggravates scratches. In chronic cases, when the skin constantly cracks open, iodine ointment may be applied once daily; if it does not prove effective, rub in a little oleate of mercury once a day. In the most obstinate cases apply a blister (p. 371), and repeat at intervals of 3 or 4 weeks if necessary.

To prevent scratches always allow mud to dry on wet legs, then brush it off. Rub skin dry after washing (sawdust is good for this) and afterward apply a little sweet oil or lanolin.

62. Mud Fever

Symptoms. *Fever, lack of appetite, soreness and stiffness, swelling, redness, heat and pain affecting the skin, especially that of white color, and resulting in chaps, cracks, and sores which may exude serum. The skin sometimes becomes hairless from scalding. Legs are first affected, inflammation sometimes spreading to the belly.*

Cause. Exposure to mud and slush; imperfect drying of the legs after washing or wetting; clipping the hair from the legs helps cause the condition.

Treatment. (1) Stop all rich feed and allow light, laxative rations. (2) Dissolve 2 teaspoonfuls of saltpeter in the drinking water twice daily. (3) In severe cases give fever medicine No. 1 (p. 372). (4) Poultice the legs with warm flaxseed meal for two days, then apply twice daily a lotion composed of 4 ounces of Goulard's extract, 2 ounces of glycerine and soft water to make one pint. If pain is severe, add an ounce or 2 of laudanum to the lotion. The scratches ointment (p. 372) also is useful.

63. Grease

Symptoms. *The skin of the heels or legs below the hocks and knee swells, becomes sore and gives forth a foul-smelling liquid. In chronic cases red-colored growths, termed "grapes," form around the pasterns.*

Cause. May be a parasitic fungus, but more commonly it is overfeeding, lack of exercise, hot, insanitary stabling, insufficient grooming, filthy condition of the skin, or washing and failure to dry the skin. The attendant rather than the "breed" or animal is to blame.

Treatment. (1) Remove causes. (2) Give horse steady work or active, daily exercise. (3) Feed lightly on simple, laxative food. (4) Poultice parts with warm flaxseed meal, adding to each poultice 3 tablespoonfuls of powdered wood charcoal and mixing 1 teaspoonful of coal tar disinfectant in each pint of water used in making the poultice. (5) Change the poultices night and morning using them until discharge subsides. (6) Then apply "white lotion" (p. 373) 3 times a day. (7) Give as medicine Fowler's solution of arsenic twice daily, (p. 367). Cut off "grapes" with a red-hot firing iron (or have veterinarian do it), then dust with powdered sulphate of copper and afterward apply twice daily a solution of 2 ounces of sulphate of zinc and 1 pint of soft water.

64. Nettle rash, Surfeit, Prickly Heat

Similar to eczema in cause and symptoms, but lumps form instead of blisters and the swellings upon the lips and muzzle may be quite large. Indigestion usually is present. This disease is akin to hives of children.

Treatment. (1) In severe cases give a purgative ball (p. 372) or 12 ounces of glauher salts in a quart of tepid water. (2) In ordinary cases give instead 2 ounces of granular hyposulphite of soda or bicarbonate of soda in 1 pint of water. (3) Wash the affected parts with a solution of 1 tablespoonful of alum or hyposulphite or bicarbonate of soda in 1 quart of soft water as often as necessary. An effective medicine is composed of sulphur 6 ounces, bicarbonate of soda 6 ounces, powdered wood charcoal 3 ounces; dose, 2 tablespoonfuls in each feed.

65. Tail Rubbing

Rubbing of the tail and mane commonly indicate lack of grooming, overfeeding and under exercise, but in many cases irritation by skin parasites or pin worms is the cause; in mares a filthy condition of the udder may cause it.

Treatment. (1) Remove the cause. (2) Cleanse the affected parts. (3) When dry pour on and rub in a mixture of 1 part of kerosene and 3 parts of cottonseed oil or machine oil. Repeat the second and third days. (4) Afterward apply every 2 or 3 days a mixture of 2 ounces of sulphur, $\frac{1}{2}$ ounce of coal tar dip and 1 pint of cottonseed oil.

Where pin worms are the cause treat as advised (p. 285). An old-fashioned treatment for tail rubbing consists in pulling upon the upstanding tags of hair of the rubbed parts until the skin "gives" with a cracking sound. Washing with strong salt water sometimes proves effective, or the stall may be fixed in one of the ways suggested in Fig. 360.

66. Warts

These rough growths of the skin, occurring singly or in masses, are usually dry but sometimes soft, bleeding when irritated. They indicate deranged nutrition of the skin and when numerous make necessary a change of feed. Remove small warts of the lips, eyelids, face, sheath, teats, or udder by rubbing daily with castor oil or fresh goose grease. Snip off with scissors small warts with narrow necks, then apply lunar caustic (nitrate of silver) or powdered blue stone (sulphate of copper). Remove large, narrow-necked warts by tying a strong silk thread tightly around them close to the body or by putting on a few small rubber bands. Such warts may also be removed with a knife or ecraseur (Fig. 437) afterward applying a hot iron or Monsel's solution or powder to stop the bleeding. Then apply pine tar daily.

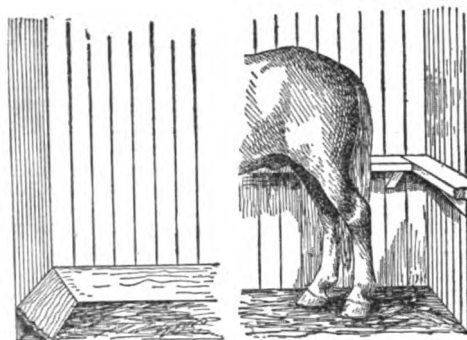


FIG. 360. Two ways to prevent tail rubbing (see text)

Give badly affected colts 20 grains of calcium sulphide in their feed twice daily. Where warts are very numerous or occur in masses on cattle give 1 ounce of Fowler's solution of arsenic twice daily in addition to local treatment. Home remedies are axle grease, coal oil, crude petroleum, pine tar, molasses, milkweed juice, a mixture of salt or bicarbonate of soda and lard, and a powder of burnt leather, soda, and lard.

67. Foul and Swollen Sheath

Collections of claylike substance (sebum) in the sheath, or a stone or "bean" of lime material in the prepuce of the penis sometimes cause difficult urination, straddling gait, ill-thrift, tail-rubbing, and pawing or kicking in the stable.

To cleanse the sheath pack it with bran wet with warm water containing 1 teaspoonful of coal tar disinfectant to the pint. Then hand-rub it thoroughly from the outside, remove the bran, and rinse well with cold water containing a tablespoonful of borax or alum to the quart. Do *not* apply lard, oil or any greasy substance as it will catch and hold dust, induce irritation and cause increased secretion. Avoid scratching the sheath when cleansing it as such wounds are readily infected and result in great swelling.

Swollen sheath is treated by constantly bathing with hot water containing a teaspoonful of coal tar disinfectant to the pint. If the swelling remains *scarify*, that is: Fit a cork upon the blade of a small, clean sharp knife, so that but a quarter of an inch of the blade projects (Fig. 361), and prick the swelling at points 2 or 3 inches apart over its entire surface. Then continue bathing. Give a purgative ball (p. 372) after feeding 2 or 3 bran mashies.

Dropsy of the sheath sometimes follows castration or is due to sluggish circulation, weak heart, overfeeding, worms, lack of grooming, lack of exercise or insanitary stables. Scarify as for *swollen sheath* if the condition is extreme. Enforce active outdoor exercise. Give tonic powders (p. 372).

68. Burns and Scalds

These may be slight or so severe as to cause death from shock. Treat by keeping air from the injured surfaces by any means at hand. For instance smear molasses thickly upon the skin, then cover with absorbent cotton, oakum or wool and a bandage; or apply a thick mixture of clay and water, with a large soft brush.

Other popular applications are carron oil (equal parts of lime water and raw linseed oil), carbolized vaseline, lanolin, white of egg, powdered chalk, whiting, starch or wheat flour. Treat for fever (p. 372) if present. Feed light rations.

Regulate the bowels

with bran mashies,

roots, or raw linseed

oil. When acute in-

flammation subsides,

prick the blisters at

their edges, or run a

needle and thread through them, so as to draw

off the fluid but leave the surface skin un-

broken. Treat sores with benzoated oxide

of zinc ointment or "white lotion" (p. 373).



FIG. 361. Knife blade inserted through cork for scarifying

69. Harness Sores and Tumors

(1) "Sit-fasts" are patches of dead, horny skin resulting from irritation by the collar, saddle, or other harness, sweat, dirt, or hair. Remove dead skin with a knife, then treat as a common wound. Large sit-fasts often form on the neck under the collar, and pus oozes out around the dead centre. In such cases cut out the dead skin and once daily pack the cavity with oakum saturated with a mixture of equal parts of turpentine and raw linseed oil. When the wound is about filled with new tissue apply "white lotion" (p. 373) twice daily. To hasten healing swab with tincture of iodine every other day. (2) If the harness rubs and forms a hard swelling paint this 3 times daily with a mixture of iodine 2 ounces and witch hazel 6 ounces. (3) If abscesses form, open them and treat as advised (p. 384). (4) Hard, solid tumors or baggy tumors on the shoulder, with a red sore or sit-fast in the centre, should be cut out and treated afterward as a common wound. Until an operation can be performed wet the sores 3 times daily with the iodine and witch hazel lotion just given or apply an ointment composed of 1 dram each of iodoform, tannic or gallic acid, and boric acid and 1 ounce of lanolin or lard. A good dusting powder for sore shoulders contains equal parts of naphthalin and slaked lime. Bathing the skin 2 or 3 times daily with cold salt water, having the harness fit properly and keeping it clean all help to prevent harness galls, boils, and tumors. Talcum powder dusted upon the bearing surfaces of harness helps to prevent chafing.

CHAPTER 27

Common Diseases of Cattle

By DR. A. S. ALEXANDER, Professor of Veterinary Science, University of Wisconsin, and author of the accompanying chapters on Diseases of Horses, Sheep, and Swine. The same simple, practical treatment and point of view have been adopted in each of these cases. Use the index of symptoms (p. 292) in recognizing diseases, as explained on page 261; the various drugs and doses mentioned are described in detail in Chapter 32.—EDITOR.

(By the Editor)

THE body structure of cattle. The general make-up and operation of the body of a cow or bull are similar to those of the horse (p. 263). But these are a few exceptions or modifications.

In the skeleton or bony system the outline and soundness of the legs and feet, though important, are less so than in the horse. On the other hand, the bony structure of the body, the openness of the joints in the backbone, the distance between hip bones, the spring of the ribs, etc., all are closely connected with the value of the animal as to both type and efficiency.

The amounts, proportion, and distribution of muscle (lean meat) and fat naturally differ in cattle of different ages, sexes, and types. The dairy bull is much more smoothly covered than the dairy cow, and both appear spare and even thin compared with the beef creature.

The digestive system shows several differences even though both horse and cow are plant eating (*herbivorous*) animals. However, cattle, like sheep, deer, buffalo, etc., are cud chewers (*ruminants*) and have specially arranged organs

to accomplish this process of *rumination*. The stomach instead of being simple has four distinct parts, the first three being merely for storage and the preparation of feed, and the fourth being fitted for active digestive work. Thus, in the cow, the gullet opens into (a) the paunch or *rumen* which has a capacity of some 45 gallons; next comes (b) the honey comb or *reticulum*; (c) then the "manyplies," "leaves," "book" or *omasum*; and (d) the *abomasum* or true stomach.

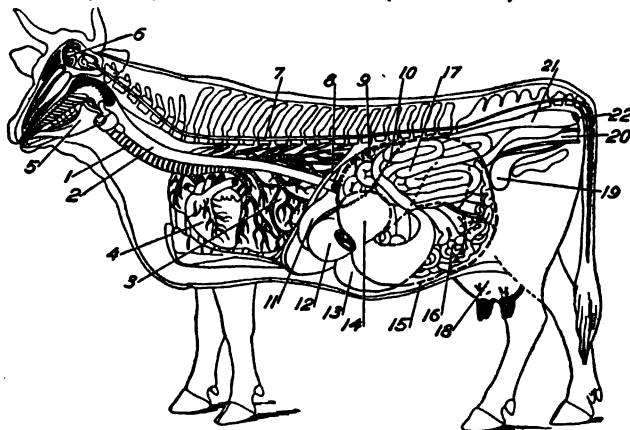


FIG. 362. Principal organs of cow. 1 windpipe; 2 gullet; 3 bronchial tubes in lungs; 4 heart; 5 jaw; 6 brain; 7 spinal cord; 8 diaphragm; 9 kidney; 10 spleen; 11 liver; 12 second stomach; 13 fourth stomach; 14 third stomach; 15 line of paunch or first stomach which covers the others; 16 small intestine; 17 colon; 18 udder; 19 bladder; 20 vagina; 21 rectum; 22 anus.

Some of the finer portions of the feed pass directly into the second or even the third stomach. The bulk of the partly chewed material remains in the paunch for some hours and is

then returned to the mouth in small masses which are chewed again, reswallowed and passed on into the second and third compartments. So long as the animal is well and its paunch supplied with coarse forage, it will carry on this

process. The failure to chew the cud is not a disease in itself or an accident, but the natural result of either a lack of food to work on, or a derangement of the digestive system in general.

The small intestine in cattle is at least

150 feet or twice as long as that in the horse; the large and small colons together measure about 35 feet and can hold some 14 gallons. This digestive apparatus enables the cow to eat, hold and work over a great deal more roughage and succulent feed than the horse, and makes her a machine for the production of milk rather than speed or work.

The *dentition*, or number (32) and arrangement of teeth, in cattle is entirely different from that of the horse. In the lower jaw there are 8 nippers (*incisors*), no tusks, 6 temporary (pre) molars, and 6 molars; in the upper jaw there are only the 12 molars, the front of the gums forming a broad, tough pad of gristle against which the incisors bite. That this may not be injured, the nippers are so inserted in the jaw as to have a little give or play. The milk teeth are much smaller (especially narrower) and smoother than the permanent set, which in turn is whiter than that in the horse. The appearance and rate of wear vary greatly so that exact determination of age is very difficult. Fig. 364 gives an idea of average conditions. The number of rings or ridges on the horns is *not* a reliable method of figuring the age of cattle.

The signs of disease in cattle as in horses include abnormal conditions of the skin and coat, visible membranes, secretions, urine and feces, unusual temperatures, pulse and breathing records, and unnatural positions and actions of the animal. The pulse may be felt in cattle on the jaw, the inside of the elbow and cannon, and the base of the tail; the beats range from 45 to 50 per minute. The normal temperature of the ox is 101 to 102½ degrees F., and breathing takes place at the rate of 12 to 15 respirations per minute. The breathing apparatus is less active and not so well adapted for muscular effort and exercise as in the horse, but on the other hand it is less liable to disease.

Cattle are of breeding age at 10 months, and depending on their size, development, etc., may be bred at from 15 to 18 months of age. Heat periods lasting 1 or 1½ day occur about every 3 weeks and about the fourth week after calving. The gestation period averages 285 days with extremes of 240 and 330 days,

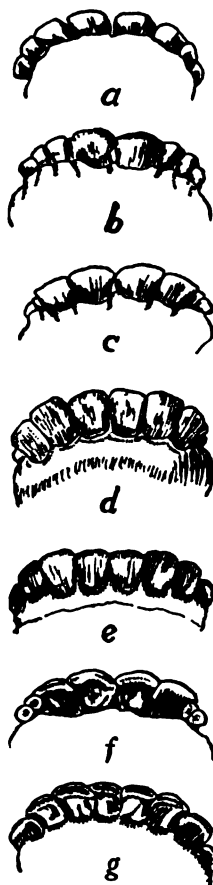


FIG. 364. Teeth of cow at different ages. *a* calf (all milk teeth); *b* at 2 years; *c* at 33 months; *d* at 42 months; *e* at 4 years (these all viewed from the outside); *f* teeth of a cow at 33 months; and *g* at 4 years, these two viewed from the inside.

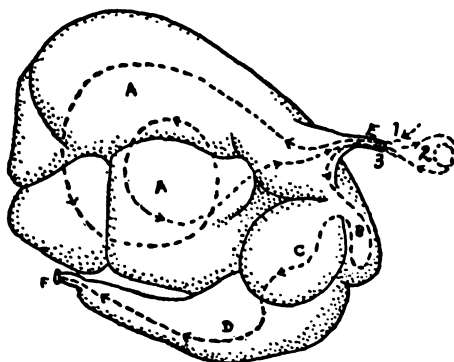


FIG. 363. Diagram of cow's stomach. Food (1) enters at E, passes into paunch (A) and back as a cud into the mouth to be chewed (2), then back again (3) into the second stomach (B), thence to third stomach (C), fourth stomach (D) and into intestines at F.

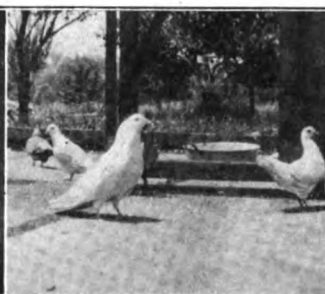
Index of Symptoms

(Numbers refer to diseases discussed in this chapter; capital letters to diseases discussed in separate chapters in Section II of this Part of this volume as follows: A=Tuberculosis p. 390; C=Contagious Abortion p. 406; D=Foot and Mouth Disease p. 412; E=Texas Fever p. 419; G=Anthrax p. 428; H=Blackleg p. 430; K=Rabies p. 431.)

Abdomen	Gradually enlarges—45	Face	Crusts or scabs on—60
Afterbirth	Retained—37, C	Feces	bloody—G
Appetite	depraved—12		Blood passed with—49
	Loss of—1, 3, 8, 13, 14, 15, 17, 18, 21, 28, 32, 34, 44, 45, 49, 52, D, E, G, K		expelled constantly, soft, of peculiar odor, stained with blood—13
	and thirst—H		liquid, yellow, foul smelling, profuse—20
Back	Bunches containing grubs on —59		scanty suppressed,—14
	Thick scabs on—61		slimy, clay colored, hard or liquid—18
Bawls	Calf—22		hard or foul smelling—16
Blindness	41		yellow, becomes brown, foul smelling—22
Blisters	on tongue, lips, cheeks, gums, udder, top of hoof, or be- tween toes—D	Feet	Steps up and down with hind —34
			tender—D
Bloats	34, 43, 44	Fetlock joint	Lameness, swollen, skin sloughs off—53
	constantly—A	Fever	1, 3, 8, 21, 22, 47, 49, D, E, G
Blood	blackish, thick, tarry—G		following chill—4, 7
	passed with feces—49		slight—14
Breathing	difficult—7, G	Flank	tightly distended—9
	fast—47, 49	Gas	in stomach—14, 22
	Gasps for breath—9	Grunts	10, 14, 15, 43
	labored—1		persistently and loudly—14
	loud—34	Head	dashed about—34
Chewing	difficult—11, D		poked out—8
	interfered with—19		Swellings on—49
	Stops—15		tucked into side—34
Chill	17, 35, G	Heat	in limbs—50c
	followed by fever—4, 7, 28, 32		periods irregular, excessive—23
Coat	dry, harsh—28	Heels	Ulcers on—21
	staring—8, 18, 45	Hock	hot, swollen—50a
	rough, hidebound—A	Hoof-Heads	Ulcers on—21
Constipation	18, 44, E	Itching	58
	follows scouring—15	Jaws	Bunch on lower jaws; opens, discharges pus, red tissue sticks out—19
Convulsions	K		Swelling behind chin, under— 11
Cough	1, 8, 13, 43, A	Joints	of calves inflamed—C
	chronic—5	Kicks	D, G
	croupy—2		at belly—10
	painful, deep sounding—7	Knee	Soft swelling on front of—40
	spasmodic—2	Lameness	acute—47
	suppressed—6		in fetlock joint—53
Crazy	44		hock—50a
Cud	Chews, irregularly—45		shifting—50c
	Stops chewing—3, 9, 13, 14, 18, 32, 34, 43, 44	Legs	Hind, paralyzed—51
			hot, painful—50c
Delirious	4, 15, 34		Stamping with hind—10
Discharge	from swellings black, frothy, bloody—H		Swellings on—49
	quickly—22	Licks	skin—51, 61
Droops	15, 16, 18, H	Lies Down	22, 51
Dull	Bunch forms under—19		by itself—D, E, H
Ear	droop—E		constantly—18, 47, 50c, G
Ears	Refuses to—D		with head tucked in right flank —15
Eat	turn out—6		
Elbows	Crusts or scabs around—60		
Eyes	Eye-balls gray, bulge—52		
	Growth on—42		
	Lids slightly swollen—52		
	redden, close, weep—4		



White Jacobin



Maltese Hen (right) and
Runt (left) for crossing



White Fantail



White Dragoon



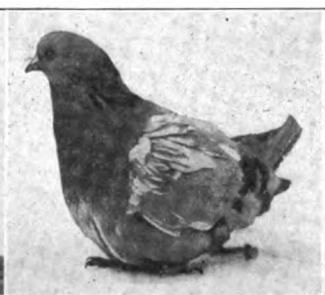
Ten-day-old squabs



Giant Runt



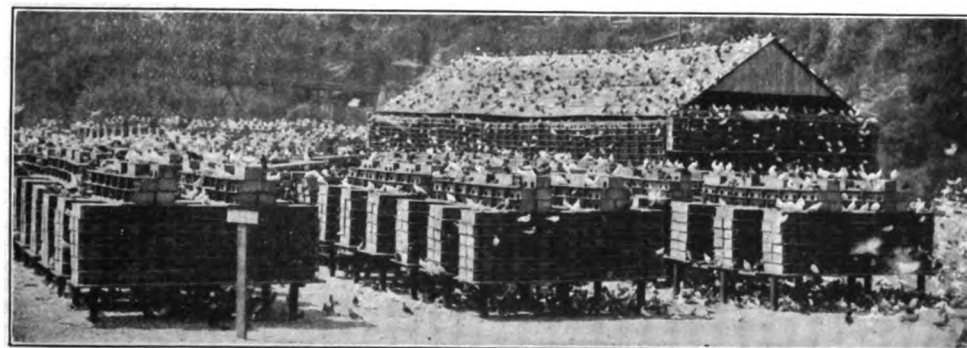
A cross-bred squab pigeon



Runt Hen

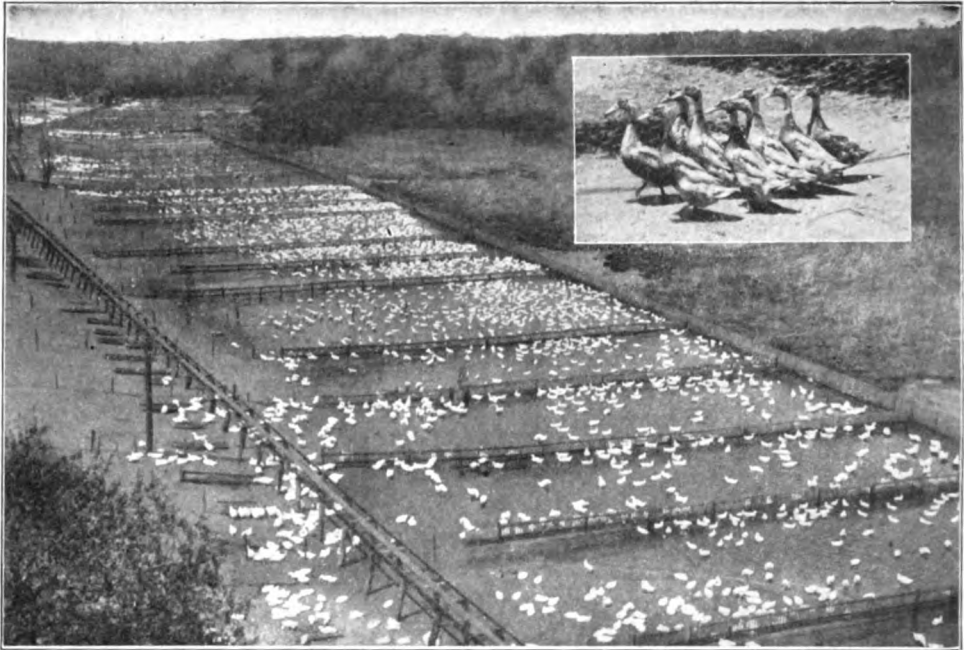


Homing Pigeon

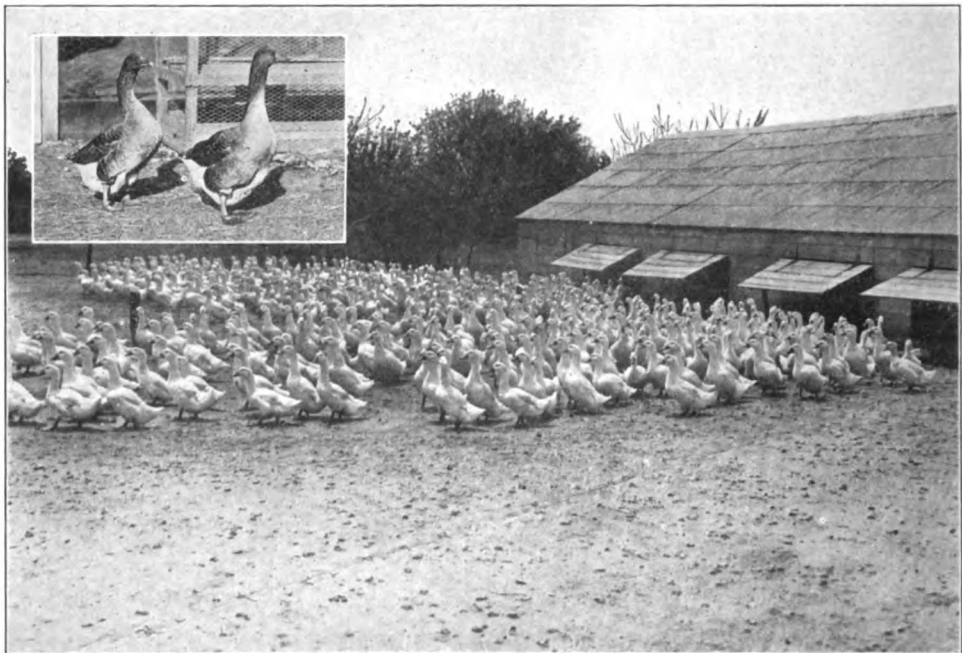


A squab farm in southern California

UTILITY BREEDS FOR PIGEON RAISING AND SQUAB PRODUCTION



General view of a Long Island duck farm; and (insert) a typical farm flock



DUCKS AND GEESE (INSERT) CAN ALWAYS BE PROFITABLY RAISED AS A FARM SIDELINE, AND SOMETIMES AS A COMMERCIAL SPECIALTY

Loses Flesh	2, 61, E (with good appetite)—A	Swallows	with difficulty—19
Milk Flow	bloody—24, 26 ceases—15, 35, E discolored, thin, bloody, or pus like, clotty—32 pale yellow or blood tinged—31 shrinks—3, 8, 13, 16, 44, 49, 52 39	Swelling	Hard, in throat, groin, or above udder—A of dewlap—6 fetlock joint—53 hock joint or stifle—50a painful, full of air, crackles when rubbed—H under jaws, behind chin—11 watery, hot and painful, then cold and painless—G abundant, changing to pus— 52
Milks Hard	G	Tears	troubles—39
Moans	discharge from—2 thick and foul smelling—4	Teat	Bleeding of growths in—24
Mouth	drips saliva—11 drooling—21 inflamed—21 membranes bluish—G open, tongue protruding—9 Smacks lips—21 Sore—D Ulcers in—4, 21 hot and dry—15 Crusts or scabs on—60 Lumps on—43 Discharge from—1, 2, 4, 7, 8 bloody—49 thick, foul smelling—4 watery—3 thickens and dries, mem- branes inflamed—3	Teats	Discharge from, abscesses on —32 swell, become red, blisters— 25 Swellings, lumps or boils at base of, rapidly enlarge —33
Muzzle	enlarged, bluish—G	Teeth	irregular—5 Grind—15 Becomes—19
Neck	feed and water return through nostrils—8	Thin	Lump on—48
Nose	6, 10 when fist is pressed into upper right flank or spine is pressed behind shoulder —15	Throat	swells—8, 21, 49 Ulcers filled with cheesy pus on —21
Nostrils	6, 10 when fist is pressed into upper right flank or spine is pressed behind shoulder —15	Tongue	enlarged, hardened, raw—19 Fluid collects in sac under—11 sore—D Thrusts out—34, 43 in hind parts—34
Pain	44, 49, K distended—14, 44	Trembles	Appearance—D
Paralyze	2	Tucked Up	cold, clammy, dark-colored—28
Paunch	E	Udder	hardens—A red, hot, tender—31 Serum in—26 swells—26 becomes red, blisters—25 is painful—32
Pot-Bellied	full and fast—47	Ulcers	on feet—50b mouth and throat—21
Prostration	discharge from vulva after calving—C	Unconscious	34 Suddenly falls—46
Pulse	34	Uneasy	D, G, K
Pus	neck and face—60 skin—58, 61	Urine	abundant—54 bloody—G brown or bloody—54 frequent, blood colored—E scant, dark colored, or honey like, or profuse and color- less—16 suppressed—55
Restless	Constant flow of, becoming stringy—C	Vagina	Discharge from—29, 30 Red mass protrudes from—36 swollen, small lumps on—29 unhealthy looking—30
Rubs	13, 22, 44, 49 White, in calves—C	Vomits	56
Saliva	Acutely—13 Deathly—21 Suddenly—44 hidebound—16	Vulva	Lips of, wide apart, discharge from—30
Scours	19 shifting—50c of legs—G	Warts	on teats—39
Sick	D in bulls—38 6, 31, 34, 49 in one quarter—H shifting—50c	Weak	8, 13, 15, 28, 45 G in hind parts—34
Skin	2	Womb	Mouth of, open—30
Slobbers	Spasmodic attempts—43		
Soreness			
Spasms			
Stamps			
Sterility			
Stiffness			
Suffocates			
Swallow			

Diseases of the Breathing System

1. Bronchitis

Inflammation of the mucous membranes of the large and small air tubes of the lung, a complication of sore throat (below), or pleurisy (below), or the result of catching cold. Symptoms. Fever, loss of appetite, cough, mucous or rusty discharge from nostrils, labored breathing. Treatment. Treat as for catarrh (below), but substitute fever medicine No. II (p. 372) if symptoms become grave. Supply light, laxative, nutritious feed. After severe symptoms subside give tonic powders (p. 372) if cow is weak.

2. Verminous Bronchitis

A form of bronchitis caused by thread-like worms (picked up in old contaminated pastures) in the windpipe and air passages of the lungs. Symptoms. Croupy, suffocating, spasmodic cough affecting calves on pasture. Discharge from nose and mouth. Emaciation and pot-bellied condition. Treatment. (1) On infested farms feed calves in stable and yard, not on pasture, until 1 year old. (2) Expose calves to fumes of burning sulphur in a tight room throwing open the doors and windows when suffocation threatens. Repeat the treatment 2 or 3 times at intervals of 24 hours. (3) Or let the calf inhale for a few seconds the fumes generated by pouring tincture of iodine on a hot brick placed in a gunny sack in which the calf's head is held during the operation. (4) On 2 or 3 alternate days give by the mouth 2 ounces of a mixture of 1 part turpentine and 3 parts raw linseed oil. (5) Employ a veterinarian to inject worm-destroying medicine directly into the windpipe. (6) Feed generously (very important).

3. Catarrh (Simple) or "Cold in the Head"

Symptoms. The mucous membranes of the nose become red and give off a watery discharge which thickens and tends to dry about the nostrils. Fever, lack of appetite, weakness, suppression of rumination and shrinking of milk. Causes. Sudden exposure to wet and cold. Irritating gases in a foul stable. Treatment. (1) Blanket comfortably in a clean box stall. (2) Give fever medicine No. I (p. 372) and dissolve $\frac{1}{2}$ ounce saltpeter in the drinking water 3 times a day. (3) Add whiskey to fever medicine if appetite fails. (4) Give soft, laxative, easily digested feed. Good nursing is most important.

4. Catarrhal Fever (Malignant Catarrh)

An acute infectious disease of the breathing and digestive organs, caused probably by a

specific germ as yet undetermined. Symptoms. Chill followed by fever; redness and closing of the eyes; weeping and general symptoms of "pink eye" (p. 310). Discharge from nose and mouth becoming thick and foul smelling. Ulcers on mouth membranes. Inflammation may be spread to horn cores. Cattle may show delirium. From 50 to 60 per cent die. Treatment. None advisable for home use. Consult veterinarian who will treat symptoms presented, which vary greatly.

5. Cough

In adult cattle chronic cough always suggests the possibility of tuberculosis; apply the tuberculin test. Any disease of the breathing apparatus also may cause cough. In calves lung worms, and in all cattle irregularities of the teeth, lodging of sharp bodies, exposure to draughts, and irritating gases in foul, poorly ventilated stables, are common causes. Regard cough merely as a symptom of irritation and try to discover and remove the cause. Treatment. (1) Wet the hay. (2) Give soft, laxative feed. (3) If fever is present give fever medicine No. I (p. 372). (4) If the throat is sore give electuary (p. 372). Treat any special disease present according to its symptoms.

6. Pleurisy

Inflammation of the membrane lining the chest cavity and that enveloping the lungs, caused especially by exposure to cold draughts. Symptoms. Those of cold and bronchitis, above, accompanied by pain, turning out of the elbows, swelling of the dewlap, suppressed cough and stiffness in moving. Usually associated with bronchitis and pneumonia. Treatment. As for pneumonia, below, tapping of the chest cavity with a trocar and canula to draw off fluid may have to be done by a veterinarian. Two-dram doses of salol given every 4 hours quickly relieve the pain and stiffness.

7. Pneumonia

Inflammation of the lung substance, caused as are colds, above, and by germ infection. Symptoms. Chill followed by fever and all of the symptoms of cold and bronchitis but in aggravated form. Difficult breathing; painful deep-sounding cough, staring coat; appetite; and rumination absent; rusty discharge from nostrils. Treatment. The disease is too serious for home treatment; employ a trained veterinarian. As first aid treat as for bronchitis (above), and warmly blanket the chest (see pneumonia of the horse p. 276).

8. Sore Throat (Laryngitis)

Inflammation resulting from any of the causes of simple catarrh, above, infection or

serious lung disease, and spreading from the nostrils. The pharynx frequently is involved. Symptoms. Fever, cough, lack of appetite, shrinkage of milk, discharge from the nostrils, swelling of the throat, head poked out. Feed and water may return through nostrils when swallowing is attempted. Treatment. (1) Poultice the throat with hot flaxseed meal and bran, or rub with double strength white liniment, (p. 372) (2) Give electuary (p. 372). (3) Supply sloppy mash. (4) Steam the head if breathing is difficult. (5) Tracheotomy (p. 385) may be performed if necessary to save life.

Diseases of the Digestive System, Including the Mouth

9. Bloat, Hoven (Tympanitis)

Distension of the paunch (rumen) with gas associated with indigestion and fermentation; common causes are sudden changes of feed, damaged, moldy, frosted, fermenting or unsuitable feed, and especially wet clover or alfalfa. Symptoms. The cow stops chewing the cud, and gasps for breath, often with mouth open and tongue protruding; the upper flank on the left side is tightly distended with gas, sometimes extending above the level of the spine, and giving out a drumlike sound when struck.

Treatment. Medicinal: Give 2 ounces of turpentine in a pint of raw linseed oil, or $\frac{1}{2}$ to 1 ounce of formaldehyde in one quart of water; or 2 ounces of a mixture of 2 parts aromatic spirits of ammonia, and 1 part each of nitrous ether and alcohol, shaken up in a pint or more of water; or $\frac{1}{2}$ to 1 ounce chloride of lime in a quart of water. Give a full dose of epsom salts after bloating subsides.

Surgical: Tap with a special trocar and canula (F g. 334). Or relieve by any one of the following means: (1) Pass a probang or rubber hose down the gullet. (2) Place a tarred rope or piece of round wood bitwise in the mouth. (3) Lead the animal into cold water, or dash cold water upon the body. (4) Put a handful of salt or bicarbonate of soda far back in the mouth. (5) Pull the tongue outward to encourage belching. (6) Stand the cow with its fore feet high. Kneading and rubbing the paunch and giving rectal injections of soapy warm water and glycerine also may help.

Prevention. Do not turn cattle on to clover or alfalfa when wet with dew or rain, or when frosted. Alfalfa in bloom rarely, if ever, causes bloat. Feed hay

before turning on green pasture. Allow free access to slaked lime and salt and at all times provide an abundance of pure drinking water. Make all changes of feed gradually and do not give any damaged or unsuitable feed.

Chronic bloating. Acute bloating comes on suddenly; chronic bloating is gradual and persistent, and the animal, commonly, is found bloated each evening.

Causes are disease of the stomach, gullet, or intestines, or presence of hair balls or other foreign bodies in the stomach. Often it is caused by enlarged tubercular glands pressing upon the gullet or nerve fibres which supply the stomach. Compression of the gullet may also be due to injury, caustic poison, an abscess, or a tumor. Pressure prevents natural belching of gas.

Treatment. Test with tuberculin in all cases, tuberculosis being an incurable cause. (1) Mix powdered wood charcoal freely in each feed. (2) Add 1 ounce of granular hyposulphite of soda and $\frac{1}{2}$ a dram of powdered nux vomica, if found necessary. (3) Gradually increase the doses of nux, if bloating persists. (4) In acute cases treat as for ordinary bloat. (5) If necessary, "tap" the paunch. In chronic bloating not due to tuberculosis, rumenotomy (p. 385) may be performed as a last resort for the possible removal of foreign bodies or the breaking down of an abscess.

10. Colic

Cattle rarely suffer from colic, but when attacked show presence of pain by groaning, getting up and down, kicking at the belly and stamping with the hind legs. Bloating may be present. Treatment. Give a flatulent colic drench (p. 371) and when pain subsides, a quart of raw linseed oil. Withhold feed for 24 hours. A hypodermic injection of 4 to 6 grains of morphin may be given instead of the drench, if the cow is not bloated.

11. Cyst Under Tongue

Fluid sometimes collects in a cyst or sac under the tongue in cattle and the smooth, rounded lump (termed "ranula") causes a swelling under the jaws behind the chin, difficulty in chewing food, and dripping of saliva from the mouth. The cause is probably the entrance of foreign bodies through a duct into the salivary gland under the jaws. Treatment. Thrust a sharp, clean knife into the centre of the cyst, thus liberating its fluid contents. Afterward rub iodine ointment once daily into the external swelling.

12. Depraved Appetite (Pica)

Under certain conditions cows ravenously chew and swallow foreign bodies such as bones, bark, wood, leather, rags, crockery,

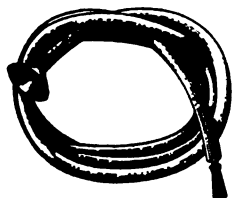


FIG. 365. Two types of probang for removing obstructions in gullet

metal or earth, which are indigestible and tend to aggravate the indigestion probably present as the cause of the trouble. It may abate quickly or become chronic. Treatment. Offer a variety of feed; prolonged feeding of the same materials may induce pica. Balance the ration to supply all needs of the body and allow free access to salt. Adding wheat bran freely to the ration sometimes proves remedial. In other cases precipitated phosphate of lime, or ground bone, in tablespoonful doses twice daily is beneficial. Veterinarians give apomorphia in a 2-grain dose with a hypodermic syringe for 3 days in succession; or, following a full dose of epsom salts to clear the bowels, give 2 or 3 drams of iodine crystals in a gelatine capsule.

13. Dysentery

Aggravated diarrhea, tending to become chronic. Caused in one infectious form (which attacks at one time practically all young and old cattle in a herd) by a specific germ; and in the non-infectious form commonly by irritants in the feed.

Symptoms. *The cow persistently scours, coughs, loses appetite and may cease ruminating; the milk flow lessens; the feces are red-brown, soft like a bran mash, and without foul odor. The cow becomes weak and "wobbly." Cow after cow becomes affected. Recovery is slow.*

Treatment. Give fluid extract of eucalyptus in $\frac{1}{2}$ to 1 ounce doses 3 times a day in a pint of flaxseed tea; or the following mixture prescribed by Dr. Steffen: Beachwood creosote, 20 drops; oil of cajuput, $\frac{1}{2}$ ounce; cottonseed oil, 2 ounces. Give this at 1 dose 4 times daily until scouring stops. Restrict water and supply light, easily digested feed.

Bloody flux (muco-enteritis), probably caused by germs in the feed, is characterized by foul smelling liquid discharges stained with blood. In severe attacks the animal is acutely sick and may die in convulsions. A mild attack, if not checked quickly, assumes the fatal form. Grazing cattle are most commonly attacked and an entire herd may become affected. **Treatment.** Stable the cattle and give them boiled milk to drink. Give eucalyptus, $\frac{1}{2}$ ounce; laudanum, 2 drams; precipitated chalk, powdered ginger and catechu, of each 2 drams, every 3 hours in 1 pint of flour gruel.

Chronic bacterial dysentery, also called *Johne's disease*, is an infectious form of scour caused by a germ similar to that of tuberculosis and is characterized by constant expulsion of liquid feces having a peculiarly disagreeable odor. The cow retains its appetite but becomes gradually emaciated and finally dies. Attacks commonly come on after some weakening sickness, or after calving, and may temporarily subside with generous feeding. The disease does not become general, only 1 or 2 cattle be-

ing affected at a time. The infection appears to remain dormant until made active by aggravating influences. After death the mucous membranes lining the small intestine, particularly the last third, are found intensely puckered or wrinkled, but presence of the disease can be proved only by microscopic examination of the mucous membranes involved. Johnin, similar to tuberculin, may be used to detect the disease. Such work is done by experiment station veterinarians. There is no remedy.

14. Impaction of the Paunch

Over-distension and clogging of the first stomach or paunch (rumen) with feed. Causes. Sudden partial or complete paralysis of the stomach; gorging or overeating of either coarse, dry, bulky forage or that which is green and succulent; pasturing of cornstalk fields or grazing withered or frosted grass; drinking large quantities of ice cold water; sudden eating of unlimited quantities of dry meal or other rich, concentrated feed.

Symptoms. *Impaired or lost appetite and cessation of cud chewing; persistent loud grunting; doughy distension of the paunch, causing it to rise above the level of the spine which appears humped and bent to the left. Gas may be present; fever is light, bowel passages are scant and dry, or suppressed.*

Treatment. (1) Completely stop all feed, but provide salt and plenty of tepid water or flaxseed tea. (2) Give fluid extract of nuxvomica in 30 drop doses every 3 or 4 hours in warm flaxseed tea. (3) Add 1 ounce doses of aromatic spirits of ammonia, if gas is present or the cow is weak. (4) Give a physic of 1 pint of castor oil in milk as soon as motions of the stomach and bowels are noticed. (5) Gradually allow soft feed after the bowels move freely. In severe cases the veterinarian administers additional drugs such as strychnin sulphate and eserine, with a hypodermic syringe, and also may add salicylic acid or salol to the doses of nuxvomica. If found absolutely necessary to save life, open the rumen and remove part of the feed (p. 385).

15. Impaction of Third Stomach (Gastro-Intestinal Catarrh)

Stoppage of the third stomach ("manyplies," "book" or omasum) with feed; formerly called "dry murrain," "fardle bound" or "stomach staggers." Not a separate disease.

Causes. Derangement of the entire digestive system due to sudden change from succulent to dry feed, or the opposite. Feeding on dry cornstalks, withered corn fodder, dead or frozen grass, or any coarse, bulky roughage without sufficient drinking water or succulent or laxative feed. Chill, lead poisoning, or transfixion of the leaves of the third stomach by wire or some other sharp object.

Symptoms. *Cessation of eating and chewing;*

grunting and teeth grinding. Animal is dull, listless and weak; muzzle is hot and dry. Constipation follows passage of liquid, bad smelling feces; milk secretion ceases. Pain is evinced when the fist is pressed into the upper right flank or when the spine is pressed behind the shoulders. The animal stands at first, then lies with head tucked into right flank and dies in 7 to 10 days; delirium may precede death.

Treatment. Acute cases die. Mild cases may recover. (1) Tap, if bloated, then inject oil freely through canula. (2) Rumenotomy (p. 385) may be resorted to, if the paunch also is impacted with feed. (3) Give medicinal treatment prescribed for impaction of the paunch (p. 298). (4) Keep cold, wet packs on the head, if craziness ensues, and stop using stimulants. (5) To quiet delirium, give repeated $\frac{1}{2}$ ounce doses of chloral hydrate each in a pint of flaxseed tea.

16. Indigestion

Cause. Damaged or fermenting feed, any sudden change or prolonged feeding of coarse, dry, innutritious food. **Symptoms.** The animal is thriftless, dull, with harsh, staring hair and hidebound skin; milk flow shrinks. Bowel discharges are slimy, hard, or foul smelling; urine is scant and dark colored, or honeylike, or profuse and colorless.

Treatment. (1) Have teeth fixed by a veterinarian, especially in the case of young cattle in which the crowns or shells of temporary (milk) teeth often fail to shed promptly and cause imperfect chewing. (2) Give a physic of epsom salts (p. 368). (3) Mix together bicarbonate of soda 6 ounces; pulverized nux vomica, 2 ounces; pulverized wood charcoal, $1\frac{1}{2}$ ounce; divide into 12 powders and give an adult cow 1 powder in 1 pint of water 3 times daily before meals. Reduce the dose for young cattle in proportion to age.

17. Loss of Appetite

Cause. Any disease may cause loss of appetite, but in many perplexing cases no cause can be found. It may be due to shock, chill or long use of the same feed.

Treatment. Stimulants, especially fluid extract of nux vomica, usually help. (1) Give 30 drops of nux vomica and 2 ounces of a mixture of 2 parts aromatic spirits of ammonia and 1 part each of alcohol and sweet spirits of nitre in a pint of strong coffee 3 times daily. (2) Gradually increase the nux vomica and add 2 teaspoonfuls of fluid extract of gentian root, if improvement is slow. (3) Tempt the appetite with whole oats and a variety of feeds. (4) Allow free access to salt.

In Southern states it is well to give in coffee or flaxseed tea or gruel one dram of quinine, dissolved in 1 dram of 20 per cent strength sulphuric acid, twice daily. Acid alone sometimes is effective. Make the drinking water

slightly acid with dilute hydrochloric acid, or give 2 ounces of dilute acetic acid twice daily in $\frac{1}{2}$ pint of water as a drench.

18. Loss of Cud

Not a disease, simply a symptom of derangement of the digestive organs, or the result of some other ailment. **Cause.** Pain, discomfort, distension or paralysis of the stomach, shock, fright, chill, fever, excess of rich, concentrated feed, damaged feed or any serious disturbances of the system.

Symptoms. *Chewing of the cud ceases, appetite disappears and the cow is dull, drooping, listless; persists in lying down and may show dry, staring coat and constipation; or may pass slimy, hard, clay colored or liquid feces. Characteristic symptoms of any special disease causing it also will be present.*

Treatment. Artificial "cuds" need not be administered; the cow will resume cud chewing when well. (1) If possible, find and remove the cause. (2) Apply the tuberculin test, if condition constantly recurs. (3) Give a physic drench (p. 371) on general principles. (4) Follow with stimulants and appetizers as in loss of appetite (above). (5) Make the cow take active exercise.

19. Lump Jaw (Actinomycosis)

Cause. The ray fungus (*actinomyces*) on grain or fodder which invades scratches or wounds of the face, jaws, gums or tongue, or gains entrance by way of a split or diseased tooth. Barley beards (awns) or chaff or seed hulls of grain often are found in the affected parts. The disease is not directly contagious and spreads only through the medium of grains and plants. The meat of an affected animal is fit for food, provided the disease has not caused fever, emaciation or internal lesions.

Symptoms. A large smooth "bunch" or tumor forms in the angle of the lower jaw, or under the ear, or between the lower jaws. The bones of the jaw, upper or lower, often become involved. The lump opens, discharges pus, then angry red tissue forms and protrudes. At length chewing is interfered with and the animal becomes thin.

Treatment. The disease in soft tissues is curable, if taken in time; if the bones are badly involved, treatment seldom pays. (1) Secure the animal. (2) Clip off the hair and cleanse the skin. (3) Cut into the centre of the



FIG. 366. Lump jaw



FIG. 367. A curette showing whole instrument and various forms of blade

mass, if it is too large to be safely dissected out. (4) Scrape the interior thoroughly with a curette (Fig. 367). (5) Pack into the centre wet absorbent cotton, dipped in powdered corrosive sublimate or white arsenic, or saturated with a 10 per cent solution of trioxid of chromium. (6) Pack dry oakum or cotton on top of the caustic dressing to keep it in place. (7) Paint the lump once daily with tincture of iodine. (8) Give 1 to 2 drams of iodide of potash 3 times a day in water to an adult cow until slobbering, loss of appetite and scurfy skin are caused, then stop until these effects subside, when the treatment may be repeated.

Wooden Tongue is that form of actinomycosis affecting the tongue and causing enlargement and hardening, denuded and sore spots and consequent slobbering and difficulty in chewing and swallowing. It rapidly responds to the above mentioned iodide of potash treatment; in addition swab the sores on the tongue every other day with tincture of iodine.

20. Scours of Calves (Simple Diarrhea)

Cause. Derangement of the digestive organs from any cause, particularly over or irregular feeding, sudden change of feed, fast drinking of milk, foamy separator milk, damaged feed, milk from dirty vessels, chill.

Symptoms. Bowel discharges are frequent, liquid, yellow in color and often bad smelling. The calf soon becomes weak, depressed, loses appetite and may show symptoms of pain. If not relieved the symptoms gradually become worse, the calf remains down apparently asleep, and dies.

Treatment. If possible locate and remove cause. As a precaution always isolate a scouring calf no matter what form of scours appears to be present. (1) Give a 1 to 4 ounce dose of castor oil shaken up in milk. (2) Follow with 1 to 2 teaspoonfuls of a mixture of 1 part salol and 2 parts subnitrate of bismuth in a little milk or water 2 or 3 times daily. (3) Add a teaspoonful of brandy if calf is weak.

Another modern treatment is to give two 30 grain tablets of sulphocarbolates of zinc, sodium and calcium and repeat in 4 hours. If pain is present give 1 teaspoonful of essence of ginger, or 10 drops of tincture of capsicum in water and a teaspoonful of paregoric in warm water once an hour. Also give 15 to 20 grains

of the sulphocarbolates every 2 or 3 hours, or in severe cases once every hour.

When calves tend to scour mix 2 tablespoonfuls of lime water in each pint of milk fed. If that does not suffice add to each pint of milk 1 teaspoonful of a mixture of $\frac{1}{4}$ ounce of formaldehyde and 16 $\frac{1}{2}$ ounces of freshly boiled water. One tablespoonful of rennet after each meal of milk is sometimes effectual. Another remedy is 2 ounces each of raw linseed oil and lime water and 1 dram of laudanum at a dose to be repeated 2 or 3 times daily if found necessary. Some give successfully tablespoonful doses of sulphur, or powdered alum or soot, and we have had good results from $\frac{1}{4}$ to 1 teaspoonful doses of coal tar disinfectant in milk.

Prevention. Carefully cleanse and sun-dry milk feeding utensils. Have calf pens clean, airy, light, disinfected, whitewashed and fresh bedded. Make calves drink slowly. Skim foam from separator milk. Feed regularly and not at long intervals. Avoid overfeeding and sudden changes of feed.

21. Sore Mouth (Stomatitis)

This may assume several different forms, namely: (a) *Simple stomatitis*, inflammation of the lining membranes of the mouth caused by coarse cut corn silage, or shredded or frozen fodder. (b) *Mycotic stomatitis*, caused by acrid (biting) molds or fungi on feed. (c) *Necrotic stomatitis* or "calf diphtheria" caused by invasion of the mouth membranes by a filth germ.

Symptoms. In simple stomatitis: drooling, intense redness of the mouth membrane, smacking of the lips and loss of appetite; then ulcerous sores form and the other symptoms become more intense. In mycotic stomatitis ulcers form also upon the heels and hoof-head (coronet) and some lameness is present, but the disease is not contagious and does not spread to other animals. In "calf diphtheria" (which is infectious and commonly fatal) yellow ulcers filled with cheesy pus are seen upon the gums, tongue, cheeks and throat; the throat swells externally; the calf has fever, refuses feed and is deathly sick.

Treatment. In simple stomatitis: Stop feeding silage or other irritating feed and substitute wet hay and soft feed; swab the mouth twice daily with a solution of 1 tablespoonful of powdered borax in a quart of soft water; and if ulcers are present, paint them with tincture of iodine. In mycotic stomatitis: Keep cattle off pasture where it commonly occurs, provide soft feed and good hay; scrape ulcers clean, then paint them with tincture of iodine and afterward swab twice daily with a solution of 1 tablespoonful each of powdered borax and alum in a quart of soft water; in obstinate cases apply tincture of iodine every other day and twice daily a 2 per cent solution of permanganate of potash. To treat the sores on the feet cleanse them perfectly; wet

them once with a solution of 2 ounces of sulphate of copper in a pint of hot water; then apply "white lotion" (p. 372) once or twice daily. Be careful to keep the cattle out of filth, as sores on the feet are readily infected and are then difficult to heal.

In *necrotic stomatitis*: Isolate affected calves in a clean, airy box stall; once daily rub the throat from ear to ear with "white liniment" (p. 372); scrape each ulcer clean with a curette (Fig. 367) then swab it very lightly with a solution of 2 grains of lunar caustic in 1 ounce of distilled water; afterward apply daily a 2 per cent solution of permanganate of potash. Support strength with milk, thin gruels, raw eggs and flaxseed jelly in milk, to which alcoholic stimulants may be added.

22. White Scours, Calf Cholera, Dysentery of Calves

An infectious disease caused by germs of the colon (intestinal) type, and either in the calf at birth or contracted at that time by way of the navel or mouth.

Symptoms. *The new born calf quickly droops, scours, lies down, apparently sleeps, or may bawl with distress, has fever, soon dies, then quickly bloats and decomposes. The discharges at first yellow, may become brown, foul smelling and accompanied by gas.*

Treatment. Medicinal treatment usually fails but a 20 cubic centimeter dose of polyvalent calf dysentery serum administered with a hypodermic syringe followed by a 10 c. c. dose or two, if necessary, often proves remedial. Scour remedies (p. 300) may also be used.

Prevention. Provide a clean, airy, well ventilated, whitewashed, disinfected, and freshly-bedded calving box stall and calf pen. Saturate the calf's navel with tincture of iodine at birth then apply slaked lime twice daily. Use the iodine again if the navel does not dry up at once. Immunize the calf against the disease by giving a hypodermic injection of the serum above mentioned, repeating the dose if necessary. Disinfect the cow's udder before the calf is allowed to suck. A pregnant cow may be similarly treated with a special germ-free serum so that her calf will not scour. Consult a graduate veterinarian about this treatment.

Diseases of, and Accidents to the Reproductive and Milk Secreting Systems

23. Barrenness

Failure of a cow to come in heat, or to conceive when bred, accompanied by constant, excessive or irregular periods of heat and abnormal vaginal discharge (see leucorrhea p. 303).

Cause. Many females are born barren, or development of the generative organs is arrested or incomplete, or conception is made impossible by mechanical obstructions or disease of the womb or ovaries. Contagious abortion (p. 406), tuberculosis (p. 390), infectious granular vaginitis (p. 302) and leucorrhea (p. 303) are common causes. The female of male and female twins, termed "free martin heifer," commonly is sexually imperfect and barren. On examination of a barren cow the veterinarian may find (a) an unbroken hymen, or a tumor (*polypus*) closing the vaginal passage; (b) the mouth of the womb abnormally closed, or twisted; (c) pus or a mummified fetus in the womb; (d) diseased conditions or cysts in the ovaries. Overfeeding and lack of exercise commonly cause barrenness, while inadequate feeding and insanitary conditions may cause failure to come to heat.

Treatment. There is no specific remedy and can be none considering the variety of causes, which when possible, must be found and removed. Treat abnormal discharges as advised for leucorrhea (p. 303). Employ a veterinarian to break down ovarian cysts by manipulation through the rectum, to open the womb before service, or to remove with special instruments pus or a fetus and then cleanse and disinfect. In some cases success has seemed to follow a daily vaginal injection of a gallon of lukewarm water containing 1 ounce of pure phosphate of soda, or the injection of yeast mixture (p. 373). Reduce fat heifers and cows by means of exercise and spare diet; build up thin ones with generous rations.

If a heifer or cow fails to come in heat she may do so if (a) fed a quart of whole oats the first thing every morning, (b) given a vaginal injection 2 or 3 times a week of half a gallon or more of lukewarm water containing 1 teaspoonful of coal tar disinfectant per quart and (c) made, so far as possible, to live a natural, or outdoor life.

24. Bloody Milk

This may be the result of the rupture of small blood vessels in the udder, an injury, acute congestion (p. 302), bleeding of growths in the teats irritated by milking, or garget (p. 303). In all such cases the blood, unless profuse, settles in clots to the bottom of the setting pan. It may also be caused by bacteria in the milk utensils, in which case all the milk turns uniformly red.

Treatment. (1) If possible, remove growths in the teats by operation. (2) Bleeding from congestion after calving usually subsides quickly if the udder is bathed with cold water 3 times daily, gently milked at such times and at night bathed with a strong solution of alum, or vinegar. (3) Give internally 1 dram of powdered copperas and 3 of salt twice daily, or

make the drinking water slightly acid with dilute sulphuric acid. (4) Where bleeding is profuse, rub in camphorated oil 3 times daily, after using alum water or vinegar. (5) Reduce rich feed. (6) Dry off if the bleeding persists, especially if garget is the cause. A farm remedy is half a pound of ground white navy beans mixed in the feed twice daily.

25. Cow Pox

A contagious disease caused by virus received from another infected cow or from a person recently vaccinated for or recovering from smallpox. It is spread from cow to cow by the milker's hands. One attack renders a cow immune against a second attack. Cowpox contracted by the milker makes him immune to smallpox. **Symptoms.** The udder and teats swell, become red and soon show an eruption of pustules (blisters), each with a concave top containing fluid in several compartments. **Treatment.** The disease must run its course. (1) Isolate affected cows and milk them last. (2) Wash the udder twice daily with a solution of 1 ounce of granular hyposulphite of soda and 1 quart of soft water. (3) Then apply glycerite of tannin to the sores. (4) Paint obstinate sores with tincture of iodine once daily. (5) Protect the udder from filth.

26. Congestion of the Udder

The swelling (*edema*) or enlargement of the udder occurring just before and at calving time is a natural condition, most common in heifers; it usually may be considered an indication of deep milking qualities. But sometimes through incomplete circulation of the blood away from the udder, it becomes abnormal.

Symptoms. *The udder becomes swollen and the swelling, which is doughy, pitting under pressure of the fingers, may spread to the navel and beyond, and high between the hind legs. It usually subsides in a few days, but may become aggravated from chilling or bruising. Serum then forms in the udder, or bloodstained milk may appear.*

Treatment. To prevent: enforce active, daily exercise and reduce feed for 6 weeks before calving. When congestion is acute, dissolve 2 to 4 ounces of glauber salts in the drinking water once daily. Massage the udder and swellings three times a day, rubbing those on the belly toward the heart. Strip away some of the fluid. Enforce exercise.

If congestion prove obstinate, bathe the udder with hot water 2 or 3 times daily, then wipe it dry, and bathe it with a mixture of 6 parts extract of witch hazel and 1 part each of fluid extracts of poke root and belladonna leaves. If the heifer or cow is quite fat or at all constipated, give 12 to 18 ounces of glauber or epsom salts and 1 pint of raw linseed oil in

3 pints of thin oatmeal gruel. Follow with 2 to 4 drams of powdered saltpeter twice daily in the drinking water.

27. Eversion of the Womb

This accident occurs after a difficult calving, rough assistance, or retention of the afterbirth which has caused straining. Unless speedily put back the womb becomes engorged with blood and easily torn; if wounded it becomes infected and if then returned the cow may die from septic inflammation.

Treatment. (1) Make the cow stand with her hind parts high, raising her hind parts with bedding if necessary. (2) To quiet cow give 1 ounce chloral hydrate in a quart of water as a drench, or 4 to 6 grains morphin with a hypodermic syringe. (3) Perfectly cleanse and disinfect the womb placing it upon a clean rubber apron, or sheet. (4) Bathe it with cold water containing a teaspoonful of coal tar disinfectant per quart. (5) Apply a cold, wet bandage spirally from the end of the protruded womb up to the body of the cow. (6) Gently knead and firmly press the protruded part nearest to the body into the vaginal opening, applying vaseline freely to make this easier. (7) Gradually reduce and press inward the entire mass and when all has been returned remove the bandage and with the hand restore each part of the womb to normal position. (8) Keep the cow standing, and if she strains apply a rope truss (Fig. 370). Straining indicates that some part of the womb is not in its proper position and this should be remedied at once.

28. Gangrene of the Udder

Mortification and sloughing of a portion of the udder, sometimes results from acute or contagious mammitis (p. 304) or an infected wound, and often proves fatal.

Symptoms. *The attack is ushered in by a chill, followed by fever, loss of appetite and weakness. The coat is harsh and dry. The udder becomes cold, clammy, and dark colored. A line of separation forms and if the cow lives the dead mass loosens and sloughs out.*

Treatment. (1) Give 2 to 4 ounces of whiskey or brandy in a pint of thin oatmeal gruel or coffee 3 times daily. (2) Twice daily add 30 grains of quinine, dissolved in 2 drams of tincture of iron; or, (3) Give 4 drams of salicylic acid or 2 ounces of hyposulphite of soda the same way. (4) Swab the affected part with tincture of iodine twice daily. A surgeon may decide to cut out the sloughing mass.

29. Inflammation of the Vagina

Symptoms. *Redness and swelling of the lips of the vulva and lining of the vagina. In infectious granular vaginitis these symptoms*

are associated with clusters of small grain-like lumps upon the mucous membranes together with an abnormal discharge. The simple form is caused by injury, bruise or laceration received during calving; the infectious form by a specific germ, the infection being contracted through breeding or by contact with infected animals or contaminated floors or gutters.

Treatment. (1) Isolate infected animals. (2) Syringe out the vagina with a lukewarm solution of 1 teaspoonful of coal tar disinfectant, carbolic acid or lysol per quart of water. (3) If necessary increase the solution in strength, and if still not effective use a $\frac{1}{2}$ per cent mixture of Lugol's solution and water (1 ounce of Lugol's solution in 3 gallons and 1 pint of warm water). (4) Or a solution of 1 ounce of granular hyposulphite of soda per gallon of water, using 2 to 4 quarts each time.

For the infectious form try $\frac{1}{2}$ dram of permanganate of potash per quart of water; if that does not succeed a similar solution of sulphate of zinc; and next a $\frac{1}{2}$ to 1 per cent solution of Lugol's solution. The veterinarian may prefer to insert capsules containing drugs.

30. Leucorrhœa—"Whites"

A chronic inflammation of the womb or vagina, or both, caused by the infection of wounds or abrasions; it may accompany debility and poor health or follow retention of the afterbirth (p. 305) or eversion of the womb (p. 302).

Symptoms. *A sticky white discharge issues from the vulva constantly or when the cow lies down; the lining membranes of the vagina are unhealthy looking; the mouth of the womb is often found open. Health fails in chronic cases and barrenness is usual.*

Treatment. Give injections as in vaginitis (p. 302). In all chronic cases have a veterinarian treat the womb by opening, cleansing, disinfecting, and swabbing out with absorbent cotton and an antiseptic solution, and give appropriate internal treatment.

31. Mammitis (Simple), "Garget"

A catarrhal inflammation of the lining membranes of the ducts of the teats, milk reservoirs and tubes leading to the milk-secreting cells. At the outset it is similar in character to cold (simple nasal catarrh) or bronchitis (catarrh of the air tubes of the lungs). The acute form is similar to pneumonia, all of the udder tissues being involved.

Cause. Chill from exposure to draughts or rains; lying upon cement floors or wet, frozen ground; standing in cold water; bruising; chasing by dogs, injury; rough, irregular or incomplete milking; overfeeding of protein-rich feed; sudden changes of feed; imperfect "drying off"; sucking of the udder by calves penned together when young.

Symptoms. *The udder becomes swollen, red, hot and tender and the milk becomes a pale yellow, whey-like or blood-tinged fluid (serum) containing clots or curds. Fever and loss of appetite are rare. There may be some stiffness in walking. Mild attacks tend to subside in 6 to 8 days.*

Treatment. Consider every case of udder disease contagious and isolate the cow till well. This may prevent much trouble if the contagious form (p. 304) is really present. (1) Give 12 to 18 ounces epsom or glauber salts and 1 pint linseed oil in 3 pints of warm water. (2) Give a heifer $\frac{1}{2}$ ounce of fluid extract of poke root and 2 drams of powdered saltpeter (give a cow double these doses) in water twice daily as a drench or otherwise. (3) Every 2 hours bathe the udder with hot water, massage well and strip away the milk. (4) Hot poultices of oatmeal, flaxseed meal and bran, or spent hops may be used instead of hot water fomentations. (5) If udder is very large, support it with a wide bandage around the body. (6) Rub the udder thoroughly 3 times daily with a mixture of 1 part each of turpentine and fluid extracts of poke root and belladonna leaves and 5 parts of warm melted lard, sweet oil, lard oil or lanolin.

32. Mammitis (Acute)

May come on at once or result from not checking a simple attack. Most cases are caused by germs which enter the udder through the blood or lymph circulations, the milk ducts, or wounds. The infection often spreads from sores at the tip of the teats, making necessary the use of milking tubes, which if not sterilized by boiling are a common cause of such infection. It may also come from contaminated floors, other affected cattle, their milk or their vaginal discharges; and it is often carried by the milker's hands. *The milk is unfit for any use.*

Symptoms. *Chill followed by fever; loss of appetite and cessation of cud chewing; hot, painful swelling of the udder or one quarter; doughy swelling of the abdominal wall and between hind legs; discolored, thin, bloody or pus-like, clotty milk which may have a foul odor; abscesses, which may form and discharge pus by way of the teats or outwardly; tumor masses in the glands. Quarters are permanently ruined for milk secretion, unless prompt, thorough treatment checks and cures the attack, which rarely happens. Usually a pus-like fluid comes from the teat of the affected quarter or all secretion stops.*

Treatment. (1) To break up the chill give once an hour hot drinks of tea, coffee or flaxseed tea sweetened with molasses and each containing 2 teaspoonfuls of essence of ginger and $\frac{1}{2}$ cupful of whiskey or brandy. (2) For fever give in water 10 drops tincture of aconite and 10 drops fluid extract of belladonna leaves alternately every 2 or 3 hours, until fever

abates, then continue belladonna every 4 hours, adding 4 drams fluid extract of poke root. (3) From outset of attack dissolve $\frac{1}{2}$ ounce of saltpeter in the drinking water every 4 hours or give it in water as a drench. (4) If the cow is fat or if gorging with feed has caused attack, give a physic before the treatment. (5) If the case becomes chronic, dissolve 1 dram of iodide of potash in the drinking water twice daily for 5 consecutive days a week for 2 or 3 weeks.

Local treatment of the udder is the same as for simple mammitis but also rub it 3 times daily with a mixture of equal quantities of warm carbolized oil and fluid extracts of poke root and belladonna leaves. If this is not enough, use a mixture of 1 part of mercurial ointment and 2 parts of lanolin, lard or soft soap. If the udder becomes hard, after the acute symptoms subside, rub in iodine ointment twice daily and later apply full strength mercurial ointment, if necessary. If an abscess forms and softens, open it, liberate pus and keep the wound clean with a 2 per cent solution of coal tar disinfectant or carbolic acid.

Isolate the affected cow at once and keep her separate until well. In chronic cases, where pus is present in a quarter, cut off a portion of the teat or slit it open to allow free drainage and fatten the cow for the butcher.

33. Mammitis (Contagious)

Caused by germs, notably those called *streptococci*, although several kinds, causing a "mixed infection," may be present. The milk becomes infective and dangerous for people and animals.

Symptoms. Swellings, lumps or boils often form at the base of the teats, rapidly enlarge and involve a quarter or the entire udder. Other outbreaks start with sores at the tips of the teats. In all cases the most acute mammitis results, the udder is ruined and gangrene may result in the sloughing of a quarter or the death of the cow. Cow after cow becomes affected and the disease may remain in a stable year after year.

Treatment. (1) Isolate affected animals. (2) Wash the udder clean and paint swellings with tincture of iodine. (3) Strip and irrigate

udder with a solution of 1 teaspoonful of salt in 1 quart of boiled water used blood warm, or a 2 per cent solution of boric acid made the same way, then massage gently. Repeat stripping and irrigating at intervals of 3 or 4 hours. (4) Keep hot, wet packs on udder for 24 hours. (5) Twice daily wipe it dry and rub in warm 3 per cent carbolized oil. (6) Use campho-phenique instead of carbolized oil in obstinate cases after discontinuing hot packs. (7) As a last resort rub in mercurial ointment twice daily.

Treat internally as for acute mammitis and when active inflammation subsides give 1 dram of iodide of potash in water twice daily until salivation results; stop for 10 days; then repeat. This latter treatment is unsafe for pregnant cows. Veterinarians should give antistreptococcic serum in such cases. In all outbreaks cleanse, disinfect and whitewash the stable under direction of a veterinarian, then keep it clean and disinfected. The milker should cleanse each udder before each milking and milk with clean, dry hands (the desirable practice at all times).

34. Milk Fever (Parturient Paresis)

Paralysis and unconsciousness of the cow just after calving, commonly attacking heavy milking cows that have had one or more calves and are in good condition. It is a disease of the well fed and pampered cow and is most common where cattle are stabled warmly and given too little exercise. Rations rich in protein fed up to calving time help induce it, but it may also occur when the cow grazes lush grass in spring. The attack seems to be due to bloodlessness of the brain possibly caused by rush of blood to the udder after calving and resultant congestion of that organ. Apparently the same disease sometimes attacks a cow before calving in which case treatment is the same as given below.

Symptoms. Following easy calving in 24 to 74 hours the cow stops eating and ruminating, becomes restless; steps up and down with her hind feet, thrusts out her tongue, becomes stiff, trembles and is weak in her hind parts, then goes down, soon becomes unconscious, breathes loudly and tucks her head into her side. In acute attacks the cow becomes delirious, dashes her head about, gets over on her side, gallops and bleats. Death quickly follows, if she is allowed to lie upon her side.

Treatment. (1) Tap (p. 387) if acutely bloated. (2) Prop her upon her chest by means of sacks filled with hay or straw. (3) Milk clean then wash teats and udder with a warm 2 per cent solution of coal tar disinfectant. (4) Inflate each quarter of the udder in turn with air by means of a bicycle pump, or rubber bulb syringe, rubber tube and sterilized milking tube (Fig. 369), or special apparatus. Then repeatedly dent in the end of each teat to cause retention of air; do not put



FIG. 368. Case of milk fever. If allowed to lie upon her side, the cow is almost sure to die

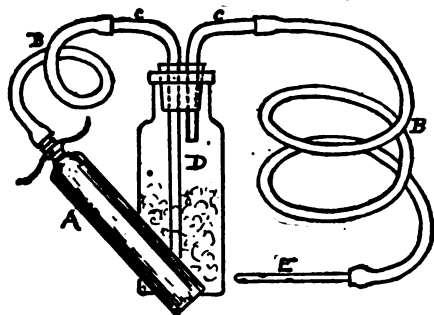


FIG. 369. Homemade milk fever outfit. A bicycle pump; B rubber tubes; C bent glass tubes; D bottle partly filled with sterilized absorbent cotton, E milk tube.

tapes or rubber bands around teats. (6) Urge the cow to rise as soon as she becomes conscious, then support her until she stands firmly. 7. Allow water, but no feed, for 8 to 12 hours.

Veterinarians give from $\frac{1}{4}$ to 1 grain of strychnine sulphate or $\frac{1}{4}$ to $\frac{1}{2}$ grain of atropin sulphate with a hypodermic syringe after inflating the udder, and then blanket the cow. If she does not get up promptly, or if she goes down again after being up, repeat the entire treatment.

Prevention. Stop all rich feed 6 weeks or more before calving and make the cow take active exercise every day. Keep her bowels relaxed. Give a full dose of epsom salts at calving time if she is constipated. Let the calf suck for a few days or do not milk out clean for 3 or 4 days after calving.

35. Milklessness (Agalactia)

Sudden suppression of milk may be caused by shock, any sudden sickness or chill; at a first calving it may be caused by inadequate feeding, but more often by chill.

Treatment. Make sure that the cow is not sucking herself or being sucked by calves or another cow. (1) Blanket warmly. (2) Give copious warm drinks of gruel or flaxseed tea, well sweetened with molasses, or warm tea with 2 to 4 ounces of gin added. Repeat at intervals of 4 hours. (3) Offer sloppy, nutritious feed. (4) If good results do not promptly follow, give 2 ounces each of ground anise and fennel seeds in warm gruel, 3 times daily.

When there is a tendency to milklessness in a herd of dairy cows, mix in each feed 1 heaping tablespoonful of a mixture of black sulphuret of antimony, 1 part; sulphur, $\frac{1}{2}$ part; powdered fennel seed, caraway seed, and juniper berries, of each $1\frac{1}{2}$ part; salt 5 parts.

36. Prolapse of the Vagina

Cause. Unthrifty, weak condition in cows that have had several calves, ulcers of the

mucous membranes of the rectum or vagina; short stall floors causing the hind parts of the pregnant cow when lying down to overhang a deep gutter into which her hind feet constantly slip when standing; straining from constipation.

Symptoms. A red rounded mass consisting of the walls of the passage to the womb (vagina), is seen protruding from the vulva, especially when the cow is lying down. Straining may result. The protruded mass may in time become injured, infected and show discoloration and abraded or diseased spots. "Falling of the womb" is not present. The condition subsides after calving.

Treatment. (1) Feed generously. (2) Build up the back part of the stall to keep the hind quarters higher than the fore quarters. (3) Cleanse, disinfect and return the protruded mass. (4) In severe cases apply a rope truss (Fig. 370). (5) Scrape ulcers in the vagina or rectum with a curetting instrument (Fig. 367). Then swab with tincture of iodine and afterward once daily with a 2 per cent solution of permanganate of potash. (6) Give tonic powders (p. 372) in the feed. (7) Feed a laxative, easily digested nutritious diet and enforce daily outdoor exercise.

37. Retention of Afterbirth (Placental Membrane)

This commonly happens after abortion or when cow is in poor health, or has been pampered, overfed and underexercised so that she is constipated. It may also occur after a very easy or a difficult calving.

Treatment. If afterbirth is not promptly expelled feed 6 to 8 quarts of whole oats at one meal and every 6 hours inject into the vagina 2 gallons of lukewarm water containing 1 teaspoonful coal tar disinfectant or salt per quart. As a remedy some dairymen give the cow her own first (colostrum) milk to drink or as a drench.

If the afterbirth does not come away inside of 48 hours remove it as follows: (1) Inject a lukewarm solution of coal tar disinfectant. (2) When it has been expelled cleanse and dis-

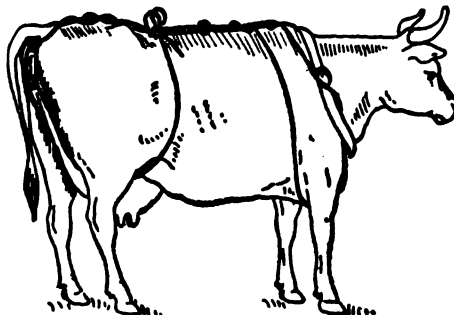


FIG. 370. How to put on a rope truss to hold a prolapsed vagina. The anchoring collar may be of rope or leather.

infect the hand and arm, clip the finger nails and apply carbolized oil. (3) Pass the right hand into the womb and gently squeeze and separate ("unbutton") the afterbirth from each mushroom-like projection (cotyledon) of the womb. Do *not* pull off the cotyledons. (4) Use the right and left hands alternately, washing clean with warm disinfectant solution and applying carbolized oil each time before passing them into the womb. (5) When all of the afterbirth that can be reached has been removed swab out the womb with absorbent cotton saturated with fresh disinfecting solution, continuing until the cotton comes away clean.

If the cow strains severely during the operation give her $\frac{1}{2}$ to 1 ounce of chloral hydrate in a quart of water; buckle a strap or tie a rope tightly around her body just in front of her udder, padding with sacking to prevent injury to the milk veins; and have an assistant squeeze down on her spine at the loins each time she strains. Afterward keep the vagina clean and disinfected, and remove any portion of the afterbirth which may protrude from the vulva at any time after the operation.

Prevention. Dry off milk secretion for 6 weeks before calving. During that time enforce daily exercise and keep the bowels active by feeding bran, oilmeal or roots. Reduce all rich feeds.

38. Sterility in Bulls

Symptoms. *The bull may be unable to serve, or his completed service may fail to have the desired effect.*

Cause. Over service when too young is a fertile cause of inability to beget calves; the bull should *not* run with the cows. Overfeeding is another common cause. Enforce daily exercise in harness or a tread power or to induce it by allowing the bull to butt at a big, smooth stump or block of wood hung by chains from an overhead beam in his yard. Confirmed masturbation is an incurable cause, as are congenital deformity and disease or incomplete development of the generative organs.

Treatment. Enforce exercise; retire the impotent bull temporarily from service; feed adequately to maintain condition but avoid fattening feeds such as corn, or relaxing feed such as silage; have a veterinarian treat any local disease present. Drugs are of little help.

39. Teat Troubles

Rudimentary or small extra teats that will interfere with milking may be safely amputated when the heifer is quite young. Some accomplish this by applying a small rubber band or fine cord placed tightly around the part. If a milk duct remains it should be destroyed by applying a red hot knitting needle, caustic potash, or lunar caustic.

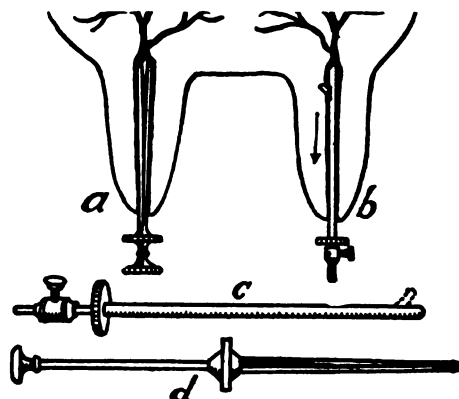


FIG. 371. Instruments for treating teat troubles. *a* dilator in teat; *b* bistoury in place ready to slit teat when drawn out; *c* bistoury as inserted (blade, shown in dotted line, is forced out when handle is pushed up); *d* dilator as inserted (the blades are spread apart when the handle is pushed home).

If two teats are united by a web of thin membrane this may be severed with a scalpel or scissors and the wounds treated with white lotion (p. 373) until healed. Sometimes it proves best to milk united teats as one.

Blind teat. If blocked with a concretion, this may be opened up at calving time with a sterilized probe or milking tube. If there is no opening, squeeze down the milk and cut open with a clean knife blade; then insert a lead dilator (Fig. 371). If a membrane closes the passage high up in the teat, a bistoury (Fig. 371) is used for the cutting (best done by the surgeon since infection is liable to result from non-expert surgery). Dry off obstinate cases.

Growths obstructing the duct may be cut out if close to the tip of the teat, or slit through with a teat bistoury in 4 different directions or cut down upon and removed by the surgeon if high up in the teat. It sometimes is possible to scrape them off by the use of a sharp-edged inverted cone-shaped instrument which is passed into the teat and pulled downward against the growths.

Hard milkers are treated by persistent use of dilators or by cutting the lining membrane of the teat duct with a teat bistoury after which a little milk must be stripped away often during the healing process. In some cases it is best to cut off a small portion of the tip of the teat.

Warts. Snip off narrow-necked warts, a few at a time, or ligate (tie tightly), with a fine cord. Rub masses of small warts with best castor oil or fresh goose grease twice daily or apply saturated solution of baking soda. Warts are not contagious. Touch an obstinate wart 2 or 3 times a week with dilute nitric acid after applying lard to the surrounding sound skin.

False duct or fistula of a teat duct may be closed when the cow is dry by dissecting out a small patch of skin about the opening, freshen-

ing the edges of the fistula by cutting, dusting with iodoform, stitching the lips of the wound together and applying iodoform-collodion. Some prefer to burn the fistula with caustic potash or a red hot knitting needle. If possible employ a trained surgeon to operate and until the operation can be performed, paint the fistulous opening with flexible collodion twice daily or try the effects of a patch or bandage of surgeons' tape.

Leaking teat. Milk 3 times a day, and twice daily immerse the teat in a cold saturated solution of alum. If that does not suffice apply flexible collodion or melted wax or paraffin after each milking, or put on a rubber thimble. In chronic cases apply caustic to the tip of the teat when the cow is dry and it may not leak after a later calving.

Wounds. Cleanse the teat and snip off all ragged and loose shreds; remove all foreign objects. Do not apply axle grease. Disinfect with a 1-1000 solution of bichlorid of mercury; then apply white lotion (p. 373) twice daily. If the cut is deep or opens into the milk duct, cleanse and disinfect as above, then dust with iodoform and apply a bandage of surgeons' tape. Afterward draw off the milk twice daily with a sterilized milking tube and in 7 to 10 days remove the plaster. Stitching commonly proves injurious. Do not apply tape to an infected wound; leave it open, disinfect twice daily, then dust with a mixture of 1 part each of acetanilid and subnitrate of bismuth and 6 parts boric acid.

Sores. Cleanse chaps, cracks, and sores with a warm saturated solution of boric acid, then apply a 2 per cent solution of carbolic acid and glycerine, or a mixture of 1 part balsam of Peru and 3 parts alcohol. Strong iodine ointment is effective for obstinate sores. Milk with clean dry hands. Keep the stall floors clean. Apply glycerite of tannin to any sore that tends to bleed. If sores form on the tips of the teats, soak them twice daily in a hot saturated solution of boric acid, then dry and apply balsam of Peru mixture; if obstinate, paint with tincture of iodine every other day. To bad-smelling sores between the halves of the udder or on the udder next to thigh apply ointment of mercury once daily after painting 2 or 3 times with tincture of iodine.

Accidents, Lameness, and Miscellaneous Troubles

40. Big Knee (Hygroma)

A serum-filled sac or cyst on the knee caused by bruising upon the floor or manger, which with the stanchions should be adjusted to prevent such injuries. Symptoms. A soft swelling forms on the front of the knee and gradually increases in size and interferes with bending of the joint, but does not necessarily cause lameness.

Treatment.

(1) Cast cow and extend leg. (2) Clip off the hair and wash clean. (3) Paint lower part of the swelling with tincture of iodine. (4) Press the fluid downward and with a sharp pointed, curved bistoury open the sac at its lowest border, liberating the contents, including clots. (5) Inject tincture of iodine and massage to work it about in the sac for a few minutes. (6) Syringe out with lukewarm but freshly boiled water. (7) Pack cavity with antiseptic gauze or oakum saturated with a mixture of equal quantities of turpentine and raw linseed oil. (8) Bandage leg from foot up over knee. (10) Renew the packing once daily until it cannot longer be introduced.



FIG. 372. Case of big knee, showing use of tape seton

The more common treatment is by means of a seton needle to run a tape down through the sac, tie a piece of leather on each end of it, smear it with tincture of iodine or turpentine and draw it up and down 2 or 3 times daily to cause serum to flow. Renew it every 3 or 4 days and remove it when serum practically ceases flowing.

41. Blindness (Amaurosis)

Sometimes affects pregnant cows, generally disappearing after they calve. The eyes remain clear, with the pupils dilated from paralysis of the retina and optic nerve. Treatment is useless. Blindness may also follow severe shock, castration or loss of blood, and then commonly is permanent.

42. Cancer of the Eye

A malignant, but not directly contagious disease caused by a fungous parasite, and eventually causing great loss of flesh. Symptoms. A small flat "proud flesh" growth appears upon the white of the eye, gradually spreads and becomes a prominent bleeding mass; pus and serum flow; the entire eye and nearby tissues become involved.

Treatment. Neglected cases prove incurable; if a competent surgeon cannot be employed, slaughter the animal for meat while in good condition. The surgeon chloroforms the cow, dissects off the forming growth and cauterizes the wound. In advanced cases he may have to remove the eye ball entirely.

43. Choke

Causes. Lodging in the gullet of a solid object such as a root, potato, apple, or egg; or packing of dry bran, meal, or grain. This may occur close to the mouth, part way down, or near the chest.

Symptoms. *The choked animal stops eating and; cud chewing, coughs, grunts, bloats, sticks out the tongue and makes spasmodic attempts to swallow. The lodged substance may cause a lump on the neck along the course of the gullet.*

Treatment. (1) Tap the paunch (p. 273), if bloated. (2) If choke persist, give cupful doses of raw linseed or cottonseed oil, melted lard, or slippery elm bark tea. (3) Place a "balling iron" (Fig. 429) in the mouth and try to reach and remove the object, an assistant, meanwhile, pressing it upward. If too far down to reach, give doses of oil now and then; knead the mass to break it up; and, if this fail, pass an oiled probang (Fig. 365), rubber hose or strong rope into the gullet and try to gently force the object downward.

If choke proves incurable, the animal may be slaughtered at once, while the meat is fit for use. Pilocarpin or arecoline combined with strychnin and followed by eserine may be given with a hypodermic syringe by the veterinarian (see Choke of horse, p. 271). Opening of the gullet (p. 385) is resorted to when other measures fail, and should not be too long delayed.

44. Cornstalk Disease

An acute disease attacking cattle pastured in corn stalk fields, caused by poisonous molds or principles (toxins) in drying corn stalks and "nubbins." Presence of prussic acid or saltpeter has been claimed by some investigators. Wild mustard has caused similar symptoms and losses. Smut of corn is not a likely cause.

Symptoms. *Cattle suddenly become sick, bloat or show marked doughy distension of the paunch in the left flank; scour or are constipated; stop eating and ruminating; shrink in*

milk flow; become crazy and charge frantically, or become paralyzed. Death quickly ensues. No bloody spots are found internally or under the skin after death.

Treatment. (1) Treat like impaction of rumen (p. 298); rumentomy (p. 385) may save life. (2) Move cattle to other pastures or change feed if cut fodder is being used. (3) Always feed cattle hay before turning them into cornstalk fields. (4) At all times supply unlimited drinking water and allow free access to salt. (5) When the disease is prevalent test safety of cornstalk fields by turning in a few scrub cattle before pasturing valuable animals.

45. Dropsy of the Abdomen (Ascites)

An effusion (escape) of serous fluid into the abdomen caused by inflammation of the lining of the abdomen or debility from chronic disease of liver, lungs, heart, or kidneys.

Symptoms. *Gradual enlarging of the abdomen, hollowness of the upper flanks, staring coat, lack of thrift and appetite, weakness, irregular cud chewing. A dull sound is given out when the abdomen is tapped and a dripping or slushing about of fluid may be heard on placing the ear to the side and handling the abdomen.*

Treatment. (1) When possible locate and remove cause. (2) With a trocar and canula tap abdominal cavity in front of the navel and remove some of the fluid. (3) Mix in the feed twice daily 1 tablespoonful of a mixture of equal parts powdered saltpeter, dried sulphate of iron, nux vomica, and gentian root. (4) Increase to 3 doses a day if necessary. (5) Feed generously and keep the bowels active.

Dropsy of the womb. Sometimes met with in the pregnant cow. Caused by an unhealthy condition of the membranes inclosing the fetus. Its inner envelope becomes distended with fluid and the cow appears to have ascites. Death may result though living calves have been born at full time in some cases. Usually the veterinarian has to draw off the fluid with a hollow needle introduced through the vagina, repeating the operation several times.

46. Epilepsy, "Fits"

Symptoms. *The animal when apparently well suddenly falls unconscious or in convulsions. Calves are commonly attacked. Attacks may be frequent, or one of them may prove fatal.*

Cause. Reflex irritation due to chronic indigestion or teething. In many cases the mother's milk contains poisonous or irritating matters. Too fast drinking of milk often causes spasm of the gullet and a convulsion in the young calf.

Treatment. *Medicinal:* (1) Give physic of salts or castor oil (p. 368). (2) Keep cold, wet

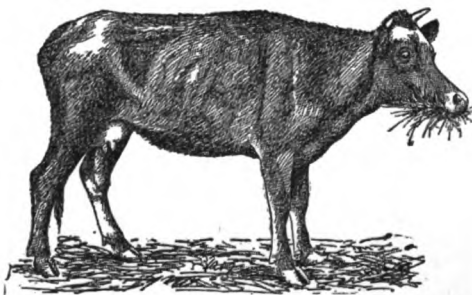


FIG. 373. Case of forage poisoning. Note crazy expression and mouthfull of unchewed hay (Kentucky Bulletin 167)

packs upon head. (3) Give 1 to 4 drams of bromide of potash in water, repeating as often as necessary. **Preventive.** (1) If possible locate and remove the cause. (2) Make calves drink slowly or give milk in a self-feeder. (3) Remove froth from separator milk. (4) Attend to the teeth, lancing swollen gums or removing milk tooth crowns (shells) in older cattle. (5) If calves are suckling, change feed of cows to a light, laxative diet, not rich in protein.

Apoplexy presents somewhat similar symptoms, in young and old cattle, and is similarly treated. Caused by overheating and an overfat condition. Attacks often are fatal.

47. Founder (Laminitis)

Inflammation of the sensitive leaves (laminae) of the feet, caused by sudden gorging with feed, overfeeding, bruising from long drives on hard roads, stanchioning for long periods on cement floors.

Symptoms. *Persistent lying down, fever, fast breathing, full, fast pulse, acute lameness. Animal scarcely can be forced to walk.*

Treatment. (1) Keep cold, wet packs upon the feet or stand animal in cold water. (2) Give 1 to 1½ pound epsom salts in 3 pints warm water. (3) Follow with ½ ounce doses of powdered alum or saltpeter every 3, 4, 6 or 12 hours according to severity of attack.

48. Goitre

Enlargement of the *thyroid* gland of the neck usually indicating inherited constitutional weakness and commonly affecting calves of pampered, diseased, or underfed cows and those kept under insanitary conditions. Cause not definitely known.

Symptoms. *A large or small, hard, soft or doughy lump is seen just below the throat-latch, or hanging from the windpipe; may "beat" like an artery; may press upon the windpipe, gullet or blood vessels and so cause death.*

Treatment. (1) Place the calf in a sunny, airy, clean pen and nourish it by every means possible. (2) Paint enlargement once daily with tincture of iodine. (3) Give iodide of potash in water twice daily (10 to 20 grain doses to a calf or 1 to 2 dram doses for an adult animal).

In acute cases scarify the gland to cause bleeding before saturating with tincture of iodine. When the condition is common in a herd remove causes, so far as possible.

49. Hemorrhagic Septicemia

A terribly fatal infectious disease or form of blood poisoning affecting cattle and other farm animals; caused by a germ (*Bacterium bovis septicum*).

Symptoms. *High fever, rapid breathing, stiffness, depression, loss of appetite, shrinkage of milk flow. A bloody discharge issues from*

the nose. Swellings, sometimes oozing blood, may occur about the head and throat and often there is swelling of the legs and paralysis. Death usually occurs in from 2 to 4 days; diarrhea often preceding it; blood may pass with the feces. After death numerous bloody areas, in size from that of a split pea to that of half a dollar, are found under the skin. Red spots also occur on the internal organs. Large quantities of bloody serum may be found in the chest cavity. The lungs are gorged with serum and sink in water. The spleen is enlarged and full of black blood. The carcass bloats and decays quickly.

Treatment. Medicinal treatment fails. At once employ a veterinarian to give hypodermic treatment with pasteurella vaccine. Move cattle to a different pasture; cleanse, disinfect, and whitewash stables; burn carcasses and in general adopt all measures advised in connection with Anthrax (p. 428).

50. Lameness

Cattle are less subject to lameness than horses but recovery often is slow or incomplete. The methods of locating lameness are practically those on page 277. Calves, like colts occasionally suffer from joint disease due to infection of the navel (p. 271) and similar measures for prevention and treatment should be adopted. When portions of the bones forming the stifle joint are fractured recovery is rare and gangrene often sets in. In such cases the animal should be slaughtered for meat as soon as the character of the injury has been determined and before inflammation and loss of flesh result.

50a. Inflammation of the hock joint (Acute Arthritis), common in cows, is caused by slipping on icy ground or wet cement floors. **Symptoms.** The joint swells, is hot and intensely painful and the leg is often held off the ground. Fever results and the cow stops eating and cud chewing. If relief is not given, a bony growth may form and cause permanent deformity with or without lameness. The stifle may be similarly affected. **Treatment.** Keep hot, wet packs or poultices upon the joint. When pain subsides wash clean and in 48 hours apply a blister (p. 371) protecting the udder with cloth; repeat blister in 3 or 4 weeks, if necessary.

50b. Foul in the foot is a swollen, sore, often ulcerated condition of the skin between the toes or the skin of the hoof-head and in its worst form is accompanied by formation of pus which burrows and separates the horn from sole or wall. **Causes.** Wading or standing in wet and filth; collection of gritty objects, manure, straw, or cornstalks between the toes; infection of scratches and sores by a filth germ present wherever pigs have been kept and in other dirty places.

Treatment. (1) Keep affected cattle in the stable. (2) Cleanse affected parts perfectly,

but do *not* pull a rope between the toes. Cut away all loose, rotten, or separated horn and remove all foreign objects. (3) Dip foot for a few minutes in a solution of 2 ounces of sulphate of copper in a pint of hot water. (4) Cover sore parts with oakum or cotton batting saturated with a mixture of 1 tablespoonful of coal tar disinfectant in a quart of soft water; renew this dressing daily.

If great pain and lameness are present, hot poultices may be applied at first. If wet dressings do not appear beneficial, at once change to a dry dressing of 1 part each of subnitrate of bismuth and calomel and 6 parts of boric acid. If the ulcers have a foul odor, scrape each one clean, paint once with a 10 per cent solution of nitrate of silver, then apply the powder just prescribed adding one part iodoform.

Fungous growths sometimes form on the front of the hoof-head just above the cleft of the toes, especially in bulls and heavy cattle, and may cause difficulty in walking. If bathed once daily, *when starting*, with a solution of 4 ounces copper sulphate in a pint of hot water, they may disappear. Chronic growths should be cut out.

50c. Rheumatism caused by damp, dark, unsanitary stables and wet beds (strictly a barn disease) sometimes affects the muscles and tendons of cattle. If the joints are affected by mysterious soreness and lameness suspect tuberculosis and have the tuberculin test applied. Symptoms. Soreness, stiffness, and lameness shifting from one part to another. The cow persists in lying down, rises with difficulty and may stagger when walking. In acute cases there may be swelling, heat, and intense pain of the affected part.

Treatment. (1) Remove cause. (2) Place cow in a sunny, light, dry, well-bedded box stall. (3) Give physic of salts (p. 368). (4) Follow with $\frac{1}{2}$ an ounce of salicylate of soda twice daily in feed or 2 drams of salol 3 times a day, if this drug is not too expensive. (5) Rub affected parts with liniment (p. 372).

51. Paralysis of Hind Legs (Paraplegia)

Symptoms. *The cow goes down, makes frequent attempts to rise, has no pain and may continue to eat and look bright. Feces and urine may be suppressed. The tail and hind legs lack sensation. Recovery may take place slowly or the paralysis prove permanent.*

Causes. When not due to milk fever (p. 304) it may be caused by a sudden slip or fall in or out of the stable; or be the result of constipation, starvation, or prolonged feeding on coarse, dry, bulky roughage, or an accompaniment of old age. It may follow prolonged feeding of cottonseed meal and hulls with little else and is present in some attacks of *hemorrhagic septicemia* (p. 309). Often no cause can be found.

Treatment. (1) Prop the cow upon her

chest. (2) Give physic of salts (p. 368). (3) Rub loins and hind legs with liniment. (4) Give increasing doses of fluid extract of nuxvomica starting with 30 drops 3 times a day in flaxseed tea. (5) Better still, have a veterinarian give hypodermic injections of strychnin or atropin.

In this and in obstinate paralysis following milk fever, it always is well to attempt to raise the cow twice daily, but slings are useless. Placing a young calf (preferably her own) in front of the cow and then throwing a dog on to her back sometimes "works like a charm," when a cow really is able to stand, but doesn't know it.

52. Pink Eye (Contagious Ophthalmia)

A contagious disease of the eyes caused by a specific germ which seems most prevalent in low, wet pastures and insanitary stables, and spreads from affected cattle or contracted in railroad cars, yards, and loading chutes. All of the cattle in a herd become affected, but other animals do not.

Symptoms. *Slight swelling of eyelids; profuse flow of tears, changing quickly to pus-like discharge. In severe cases the eyeballs become pearl-gray, bulge and show ulcers. Mild cases quickly clear up. The worst affected animals may become permanently blind from rupture of the eyeball. Affected cattle lose appetite and in acute cases lose flesh; cows shrink in milk flow.*

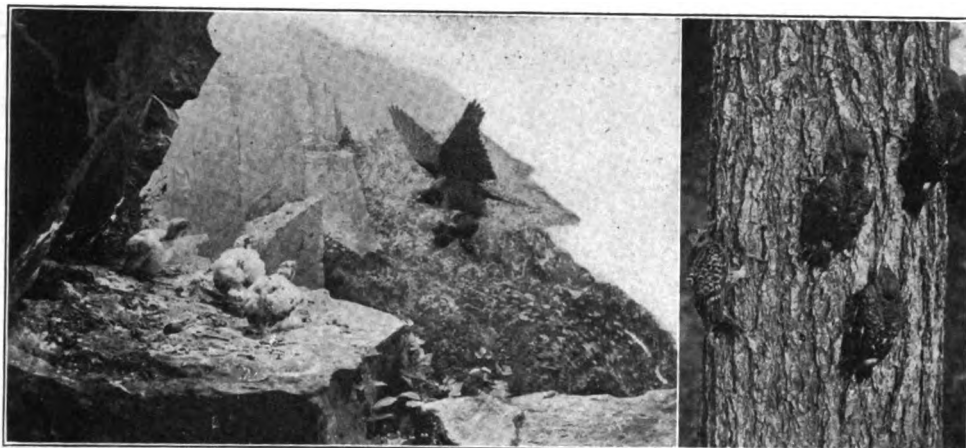
Treatment. (1) Isolate affected cattle in a darkened stable. (2) Give light, laxative rations. (3) In mild cases bathe the eyes twice daily with a saturated solution of boric acid. (4) Every other day dust eyeballs with a mixture of equal quantities of finely powdered calomel and boric acid, or place a little 1 per cent yellow oxide of mercury ointment under the lower eyelid. (5) In severe cases wet the eyeball twice daily by means of a medicine dropper with a solution of 2 grains nitrate of silver in 1 ounce of distilled water, or with a 2 per cent solution of sulphate of zinc. (6) Paint obstinate ulcers every other day with a 10 per cent solution of nitrate of silver.



FIG. 374. Foot of cow showing result of poisoning with ergot.

53. Poisoning with Ergot (Ergotism)

This frequently happens in winter and spring when cattle have to wade in snow and slush and are eating grain, hay or ripe June grass infested with ergot, which occurs as a purple-black fungus spur projecting from the seed hulls of grain or grass. This fungous poison



A few birds are the farmer's enemies, but most of them are insect destroyers and help him in other ways

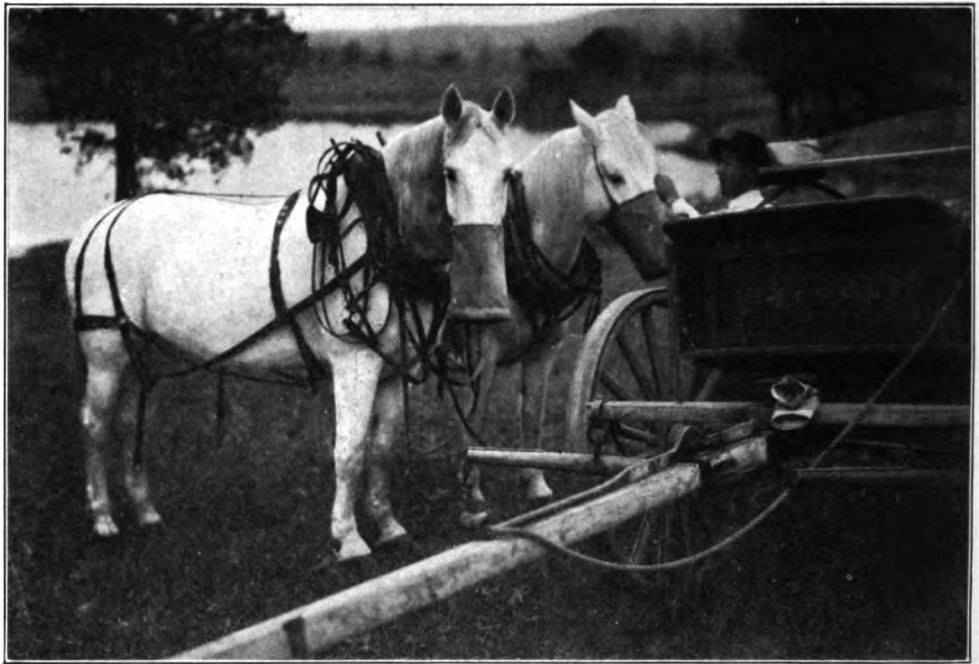


A typical turkey drive in Texas (Courtesy Cuero Commercial Club)



A turkey ranch in California

BIRDS AS FRIENDS AND FOES



Good food, clean water, rest, and kindly, regular treatment prevent more troubles than medicines cure



Keep shoulders and harness clean and well fitted to each other, and sores and galls will rarely bother

THE PREVENTION OF LIVESTOCK DISEASES IS EASIER, CHEAPER, AND MORE EFFECTIVE THAN THEIR CURE

causes a reduction in the inside diameter of the small blood vessels of the limbs and checks the circulation in them.

Symptoms. *Lameness and swelling of the fetlock joints, and sloughing of the tissues in a ring around the leg, with exposure of the tendons and bone in severe cases. Parts below this line may drop off. Ergot also causes abortion.*

Treatment. (1) Remove cause and house cattle comfortably. (2) Physic to open bowels. (3) Give stimulants to increase circulation. (4) Dress sores twice daily with a 2 per cent solution of permanganate of potash. Treatment fails in advanced cases.

54. Red Water, Bloody Urine (Hematuria)

Symptoms. *The urine is stained red or brown with blood or blood-coloring matter, or contains blood clots, or flows as almost pure blood; albumen commonly is present in it.*

Cause. A flow of blood usually is due to an injury or presence of a stone or gravel. Bloodstained or discolored urine most often is the result of acid matters in feed and commonly occurs in cattle grazing wild land or marshes. They lose flesh and may die. Molds in oats or other grain often cause the condition in calves. Blood flow from the body openings also is a symptom of anthrax (p. 428) or *hemorrhagic septicemia* (p. 309).

Treatment. (1) Change pasture and feed. (2) Give physic of epsom salts. (3) Follow with 1 to 2 dram doses each of powdered copperas (sulphate of iron), alum and gentian root in feed twice daily. If the disease is prevalent, consult your state or agricultural experiment station veterinarian.

Diabetes. Profuse urination may result from the same causes as red water, especially acid plants and molds in feed. Remove the cause and give 1 to 2 dram doses of sulphate of iron or iodide of potash twice daily.

55. Stoppage of Urine

Urine may be wholly or partially suppressed by the blocking of the prepuce and sheath with limy material or of the urinary passage (urethra) with gravel or a stone. In some instances stoppage is caused by paralysis or spasm of the neck of the bladder.

Symptoms. *The animal becomes sick, depressed, loses appetite, stops chewing the cud, strains and entirely ceases urination or passes urine in jets or dribbles. Urine may be blood-stained.*

Treatment. (1) If the urethra is blocked a veterinarian should puncture the bladder with a trocar and draw off the urine through a canula, if he cannot remove the gravel or stone by cutting into the urethra; in an emergency he may simply open the urethra by making an incision below the anus. (2) Collections of limy matter may be syringed and

scooped out after clipping the hair from the sheath; then disinfect the parts with a 2 per cent solution of permanganate of potash and smear with a mixture of 1 dram of iodoform per ounce of lard. (3) Spasm is relieved by giving 1 ounce of chloral hydrate in a quart of soft water and applying hot, wet packs to the loins.

56. Vomiting

Cattle rarely vomit, but may do so, if given an excess of starchy feed, such as potatoes. Other causes are: overloading of the paunch, distention with gas, green alfalfa, distillery slop or fermenting brewers' grains. A split or diseased molar tooth commonly causes "quidding" of hay (food expelled in wads); dropping of feed may indicate presence of a nail, or other sharp object in the tongue, throat, gullet or stomach wall, or derangement due to a tumor, abscess, or paralysis of the pharynx, or dilation of the gullet.

Treatment. (1) If possible, locate and remove cause. (2) Withhold all feed for at least 24 hours. (3) Give $\frac{1}{2}$ to 1 ounce of chloral hydrate in 1 quart of water or flaxseed tea. (4) Follow every 4 hours with 1 dram subnitrate of bismuth and $\frac{1}{2}$ ounce powdered charcoal in a little water. (5) Mix limewater freely in milk to be drunk by an affected calf.

Parasites

57. Flies

The flies that most annoy cattle are: (1) the Horn-fly or Saw-fly, a small blood-sucker that causes loss of flesh and shrinkage in milk flow. They cluster around the horns at night and under the belly in wet weather; (2) the Buffalo Gnat, common in the South from April to July, attacks in swarms, sucks blood, poisons the wound and thus kills many animals; (3) the Black Horse-fly, a blood-sucker about an inch long; (4) Greenhead Horse-fly, common near the seashore but only in hot, dry weather; (5) the Screw-worm Fly, common in the South, of which the female lays eggs in wounds; grubs hatch in about 9 hours and burrow into the tissues causing intense irritation; (6) the Stable-fly, whose



FIG. 375. Cluster of horn or saw flies at base of cow's horn

bite causes a blister which breaks and produces a scab; (7) House-flies and Mosquitoes; and (8) the Ox Warble Fly (see 59 below).

Treatment. Commercial fly repellants keep all flies away if used frequently and freely; to be effective they should contain such ingredients as fish oil and oil of tar (p. 370). A 5 per cent solution of ammonia in water is useful for allaying irritation from bites. Paint swellings with tincture of iodine. Give stimulants freely to cattle weakened by buffalo gnats. Do away with manure piles near stables, as they breed flies. Screen doors and windows; also darken the stables to keep out stinging flies. Destroy screw worms by injecting chloroform or a 2 per cent solution of coal tar dip or carbolic acid; also remove the grubs with forceps.

58. Lice

Two sucking lice, "blue lice" and one biting louse affect cattle causing constant licking, itching, and rubbing.

Treatment. (1) Cleanse, disinfect, and whitewash stables, woodwork, rubbing places, also blankets, halters, and tie straps. (2) In cold weather dust skin freely as often as necessary with a mixture of equal parts powdered sabadilla or pyrethrum, sulphur, and tobacco leaves. Naphthalin and veratrum powder are valuable additions and some people even add Portland cement. Avoid use of mercurial ointment; it is effective but poisonous, and, therefore, dangerous. (3) In moderate weather cattle may be washed with a decoction of 4 ounces of stavesacre or larkspur seeds and 1 gallon of boiling water, used when cool, or with a solution of coal tar dip made according to manufacturer's directions. Repeat as required.

59. Ox Warble Fly Grubs

Grubs (larvae) occur in "boils" upon the backs of cattle in winter and spring. These develop from eggs laid during fly time in summer by the ox warble fly about the size of a honey bee; body black, covered with fine hair; middle section showing crosswise grey bands.

Symptoms. Raised "bunches" or "boils" are found on the loin or elsewhere on the back and on squeezing mature ones large grubs emerge. Cattle are irritated by the grubs and may lick and rub. If badly infested, they may fail to thrive or shrink in milk flow. Hides are seriously damaged for leather by warble grub holes.

Treatment. (1) Squeeze out and destroy mature grubs by hand or by pressing hard upon the boil with the open mouth of a large bottle. (2) Once a week wash the back with a 1-50 solution of coal tar dip, or (3) apply salt freely to the wetted back to be licked off by the other cattle. (4) Protect cattle against flies in summer by free and frequent sprayings with commercial fly repellants.

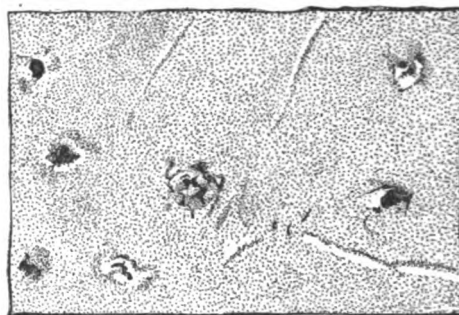


FIG. 376. Piece of leather showing holes caused by ox warble grubs

60. Ringworm, "Barn Itch"

A contagious disease affecting the skin of the face, neck, and body in winter and spring, caused by a vegetable parasite which also lives on damp walls, woodwork, etc. The disease may be communicated to man. Symptoms. Crust or scab covered spots appear about the eyes, on the face or neck and sometimes upon the body. Young cattle most commonly are affected. Affected animals itch and rub.

Treatment. (1) Isolate affected animals. (2) Cleanse, disinfect, whitewash, light and ventilate the stables. (3) Soften scabs by applying sweet oil or cottonseed oil daily until they may be entirely removed by scrubbing with soap and hot water. (4) Then paint twice daily with tincture of iodine, or apply iodine ointment daily. (5) Rub iodoform daily into sores on the upper eyelids. (6) On adult cattle wet spots on body with a solution of 4 ounces of sulphate of copper and 1 pint of hot water and repeat when necessary.

61. Scab, Itch, or Mange

Cattle are affected chiefly by two forms of scab, namely, *common scab* or *mange* caused by the mite *Psoroptes Communis, bovis*, affecting the back, loins and croup which become covered with thick scabs, and causing the animal to rub, lick, and lose flesh; and *Symptomatic scab*, not common, caused by the mite *Symptoties Communis, bovis*, affecting the skin around the base of the tail and rump and causing less irritation than the common form.

Treatment. (1) Dip cattle in lime-sulphur dip made as follows: Boil together for 2 hours unslaked lime, 8 pounds; sulphur, 24 pounds; water, 100 gallons. Use at a temperature of 100 to 110 degrees F. keeping the animal in it for 2 or 3 minutes. (2) Cleanse, disinfect, and whitewash stables, stalls, feed racks, mangers and fences. (3) Plow yards and paddocks.

Commercial coal tar dips also are effective, especially if 16½ pounds of sulphur are added to every 100 gallons of solution.

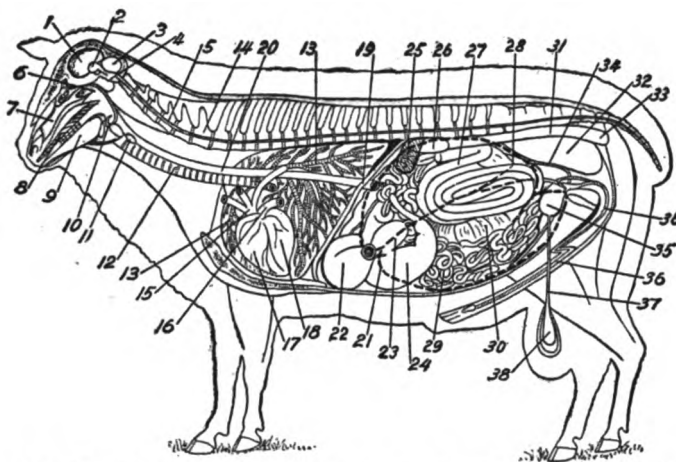


FIG. 377. The sheep's body and its important parts. 1, 2, 3, 4, parts of brain; 5, spinal cord; 6, pharynx; 7, cavities in skull; 8, gums; 9, tongue; 10, larynx; 11, thyroid gland; 12, windpipe; 13, air tubes in lung; 14, spinal column; 15, aorta; 16, pulmonary artery (to lungs); 17 and 18, two halves of heart; 19, pleura or lining of chest cavity; 20, gullet; 21, position of first stomach; 22, second stomach; 23, third stomach; 24, fourth stomach; 25, spleen; 26, left kidney; 27, ilium (large intestine); 28, colon (large intestine); 29, jejunum (small intestine); 30, membrane of abdominal cavity; 31, rectum; 32, pelvic cavity; 33, anus; 34, ureter; 35, bladder; 36, urethra; 37, tube from testicle to penis; 38, testicles.

CHAPTER 28

Common Diseases of Sheep

By DR. A. S. ALEXANDER, Professor of Veterinary Science, University of Wisconsin. For several reasons it is harder to recognize and cure disease in sheep than in most domestic animals. Their timidity and nervous activity keep them aloof from the average farmer's observation. Their numbers and more or less constant presence on the range or pasture make individual examination difficult, and their fleece, covering and masking the body outline and skin condition, serves to hide rather than reveal the actual state of their health except to the experienced sheepman. Probably the success of the expert shepherd is due more to his efforts and skill in the direction of preventing troubles than in curing them after they arrive. Nevertheless some of the following are almost certain to attack the average flock at one time or another. The aim should be to keep their number and effects at the lowest possible point by practicing modern methods and at all times giving careful attention to feeding, sanitation, and the other details discussed in Chapters 9 and 10.—EDITOR.

The Sheep's Body and Its Work

(By the Editor)

THE sheep's body. As far as its body structure and operation are concerned, the sheep can be considered as a small edition of the cow. That is, the important organs, teeth arrangement, practice of chewing a cud, method of eating, and style of feed, are all practically the same in both animals.

The stomach shows the same 4-part arrangement and operation as that of the cow; the total length of the intestinal tract is about 107 feet. The heart beats 70 to 80 times per minute; the temperature averages about 103 degrees; and the rate of breathing is from 12 to 20 per minute.

The teeth of the sheep and goat not only indicate their age up to 8 or 9 years of age, but also their degree of usefulness, since a grazing animal with many missing, imperfect, or badly worn teeth is practically unable to feed itself. As shown

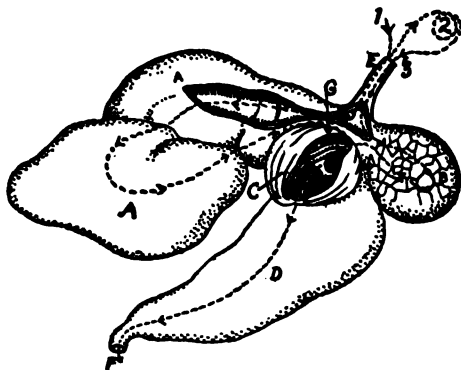


FIG. 378. The arrangement of the sheep's four stomachs is the same as in the cow. Food enters the gullet at *e*, passes into the first stomach *a*, then back to the mouth to be ruminated (2), then into the second stomach *b*, the smaller third stomach *c*, the fourth stomach *d*, and into the intestine at *f*.

the sheep begins at 6 months but neither ewes nor rams are ordinarily bred till 1½ year old. During the breeding season, heat periods occur at 13 to 19 day intervals and last 1 to 3 days. After lambing a ewe comes in season only after 5 to 6 months. She carries her lamb or lambs from 140 to 156 days or 147 on the average.

in Fig. 364, the centre pair of temporary uppers gives way to a permanent pair at from 13 to 15 months. The next pair of permanent teeth comes in about a year later, and the others at almost 12 month intervals. After the fourth year when the animal has a "full mouth," the teeth gradually grow narrower, slimmer, and shorter and finally disappear.

The breeding age of



FIG. 379. The teeth of a sheep viewed from the outside at different ages. *a* 1 year; *b* 18 months; *c* 2 years; *d* 3 years; *e* 4 years.

Index of Symptoms

(In this index D refers to Foot and Mouth Disease. See Chapter 37, p. 412).

Abdomen	Gradually enlarges; sounds dull when tapped with fingers; fluid slushes inside—1	Discharge	Bloody, from body openings—10
Abscesses	Swellings on floor of—8 filled with pus at navel and joints—13 on udder—6		from nose—34c
Appetite	Loss of—3, 6, 7, 10, 11, 17, 18, 22, 23, 24, 25, 26		bad smelling—26
Back	is arched—8		rusty—23
Belly	Swelling under—34a, 34c		from vagina—12
Bites and Scratches	30		thick and blood stained—31
Blisters	between toes or base of dew claws—D	Dull	7, 8, 13
	on lips, tongue, gums—21	Elbows	turned out—26
Breathing	difficult—4, 14	Eye	membranes lining eyelids inflamed—2
	fast—3, 27		pale—34a
	labored—25, 26		red—24, 31
Chill	followed by fever—12, 26	Eyes	swollen—2
Constipation	7, 15, 22, 34c		pearl colored, bulge, burst open—2
Cough	24, 27, 31	Feces	fluid, discharged often or spasmodically—17
	croupy—34c		hard, dry, covered with mucus—16
	deep—26		Lack of—22
	moist—23, 25		slimy, scant—15
	persistent—23, 25		white or grayish, frothy, bad smelling—20
Cud	Stops chewing—18, 22, 26	Fever	3, 6, 10, 11, 12, 13, 23, 25, 26, 27
Diarrhea	7, 13, 17, 34a, 34c	Flank	Left one swollen, drumlike when tapped with fingers—14
	Chronic—34b		

Flanks	heave—25, 26		
Grunts	25		
Head	stuck out—27	Sloughing	Sores on bare—11
	tossed about—31	Sneezes	stained yellow—32
Hoofs	rot, die, drop off—D	Sores	sores on lips—9
Inflammation	of eyelid membrane—2		24, 31
	nostrils—31		infected by grubs—33
	udder—6		on lips, head, skin, nose,
	in feet—3		cheeks, gums, hard pal-
Jaws	swelling under—7, 34a, 34b		ate, external genitals or
Lameness	in all feet—3, 5, 6		legs—9
	slight—D		reddish, on bare skin, inside
Lies down	3, 12, 13		fore and hind legs, ex-
	but rises often—22		ternal genitals, lips, and
Loss of Flesh	1, 31, 34a, 34b, 34c	Staggers	underside of tail—11
Membranes	lining eyelids inflamed—2	Stamps	14, 31
	of body openings stained yel-	Stiffness	81
	low—19, 32	Straddles	3, 6, 10, 25
	eyes pale—34a	Strains	when walking—6
	red—2, 24, 31	Stretches and	8, 15, 22
Milk	suppressed—12	Strains	15
Mouth	blisters in—21	Swallows	with difficulty—4, 27
	held open—27	Swelling	at navel—13
Nostrils	Discharge from—24, 34c		of left flank—14
	bad smelling—26		of paunch—18
	rusty—23, 25		of udder—6, 12
	thick, blood stained—31		on belly and under jaws—
	Feed and water return		7, 34a
	through—27		under throat—4
	inflamed—31	Teeth	gritted with pain—26
Nursing	Lamb stops—13, 20	Thriftlessness	1, 4, 19
Pain	25, 26	Throat	Swellings under—4
	in belly—15	Turns	in circles—31a
Paralysis	10, 31	Udder	Abscesses on—6
Paunch	swells—18		is red, swells, hardens, turns
Pines Away	31c		“black and blue,” dies,
Pot Bellied	Lambs—34a, 34b		sloughs away—6
Pus	from blisters on feet—D	Urine	bloody, dribbles—8
	navel—13		red—7
Restlessness	15		retained—8
Rubs and		Vagina	bad swelling discharge from—
Scratches	28, 29, 30		12
Sick	Appears—7, 20		Membranes of, inflamed, ul-
Skin	Crusts on—30		cerated—12
	pale—34a, 34b	Walk	Refuses or unable to—3
	papery—34c	Weakness	Sheep straddle when they—6
	Small red spots on—30	Wool	1, 8, 10, 17, 34a, 34b, 34c
			falls out—80

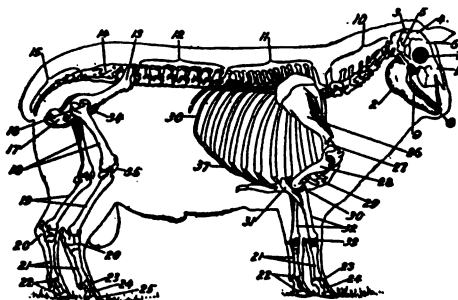


FIG. 380. The bony framework of the sheep. 1, 3, 4, 5, 6, parts of skull; 2, lower jaw; 7, eye socket; 8, incisor teeth; 9, molar teeth; 10, cervical (chest) vertebrae; 11, dorsal (back) vertebrae; 12, lumbar (loin) vertebrae; 13, ilium; 14, sacrum; 15, caudal (tail) vertebrae; 16, hip joint; 17, ischium; 18, femur (thigh); 19, tibia (leg); 20, tarsal bones; 21, metacarpal bones; 22, sesamoid; 23, pastern; 24, coronet; 25, coffin bones; 26, scapula (shoulder blade); 27, shoulder joint; 28, humerus (upper arm); 29, sternum; 30, elbow joint; 31, ulna, and 32, radius (arm bones); 33, carpal bones; 34, pubis; 35, patella (knee pan); 36, ribs; 37, rib cartilages.

General Diseases

1. Dropsy of the Abdomen—Ascites

Inflammation of the lining membrane of the abdominal cavity with a collection there of serous fluid, caused by some chronic disease of the heart, kidneys, or liver; by inflammation of the membrane lining the abdominal cavity; or by metritis (p. 320).

Symptoms. *Gradual enlargement of the abdomen, with dullness of the lower portion when tapped with the fingers; slushing about of fluid when abdomen is moved; ill-thrift; loss of flesh; weakness.*

Treatment. The fluid may be drawn off with trocar and canula inserted from below, but disease generally proves fatal. Give 20 to 30 grains each of iodine and iodide of potash in water twice daily. Sheep may be slaughtered for meat at outset of attack.

2. Eye Disease—Ophthalmia

Symptoms. *The disease may be a simple inflammation of the membrane lining the eyelids, or assume a grave form, characterized by swelling, redness of the membrane, copious flow of tears*



FIG. 381. A sheep's foot badly affected by foot rot

and sometimes changes in the eye itself which becomes pearl-colored, bulging and sometimes ruptured.

Cause. Burning by dip solutions, injuries, foreign bodies, dust, irritating gases, exposure to wind

driving over snow, specific germs. The acute form caused by germs is called "pink-eye" (*contagious ophthalmia*).

Treatment. (1) Bathe eyes with a 4 per cent (saturated) solution of boric acid twice daily. (2) In severe cases treat as for "pink-eye" of cattle (p. 310) starting with a 2 to 4 ounce dose of epsom salts in water. (3) Where caustic solutions have caused the inflammation, put a few drops of raw linseed oil in the eye. (4) Protect against causes mentioned, especially winds driving over snow.

3. Founder—Laminitis

Symptoms. *Great stiffness, inflammation and lameness in all feet. The animal lies down and can scarcely be made to walk, has fever, breathes fast, and does not care to eat.*

Cause. In ewes, infection of the womb (p. 320); in fattening lambs and sheep, overfeeding or gorging on grain. In all sheep it may follow a long drive on a hard road.

Treatment. (1) Give 2 to 4 ounces of epsom salts in water. (2) Then 20 to 40 grains of saltpeter or alum 2 or 3 times daily in water. (3) Apply continuously cold, wet

swabs to the feet. (4) Trim and level the hoofs, if overgrown.

4. Goitre

Symptoms. *A swelling appears just under the throat (in lambs it may extend a considerable distance toward the chest), presses upon the windpipe and may cause difficulty in breathing and swallowing. The animal usually shows ill-thrift. Lambs sometimes are affected at birth.*

Cause. The enlargement of the thyroid gland of the neck, which is the result of hereditary tendency (lambs sired by a goitre-affected ram commonly are similarly affected); debility from in-and-in-breeding, pampering or poor feed and management; unhealthy environment; low, wet land.

Treatment. Remove causes; infuse fresh blood into flock; do not breed from affected stock; feed pregnant ewes generously. To treat the goitre itself: (1) Scarify (p. 289) and bathe with hot water to induce bleeding. (2) Saturate daily with tincture of iodine. (3) If necessary, give from 5 to 20 grains of iodide of potash in water twice daily.

5. Lameness—Simple Foot Rot

When a lame sheep is noticed, separate it from the flock and examine it carefully to determine the cause. If a number of sheep suddenly become lame at one time, the trouble is probably simple "Foul in the Foot" (non-contagious foot rot) caused by wading in filth, wet mud or grit and the lodging of foreign bodies between the toes. It is most troublesome in wet seasons on low pastures. In some instances the canal of the gland that supplies lubricant and is located in the hoofhead above the separation of the toes becomes blocked and pus forms. In severe cases of lameness true contagious foot rot (p. 319) is present.

Treatment. (1) Cut away all loose and rotten hoof-horn, causing as little bleeding as possible. (2) Perfectly cleanse the hoof with a warm 5 per cent solution of coal tar disinfectant. (3) Bind cotton batting or oakum saturated with the solution on the foot by means of a narrow bandage passed between the toes and criss-crossed around the pastern; renew daily. (4) Where an abscess is present, liberate the pus by cutting, cleanse the canal perfectly, swab with tincture of iodine, and apply the wet dressing.

6. Mammitis—Garget

Inflammation of the udder caused by chill, bruise, incomplete milking by lamb, souring and curdling of milk at weaning time or before, overfeeding of protein-rich feed, infection, especially in connection with inflammation of the womb (p. 320).

Symptoms. *Fever or loss of appetite. The*

ewe is stiff or lame and straddles when walking. The udder swells, hardens and from red at first quickly turns purple-red or "black and blue." Death of the tissues of the gland (gangrene) and sloughing may occur, or abscesses may form and burst, discharging pus externally or into the gland tissue and out through the teats.

Treatment. (1) Give 4 ounces of epsom salts dissolved in warm water. (2) Follow with 20 to 40 grains each of saltpeter and powdered poke root twice daily in water. (3) Bathe udder frequently with hot water, stripping out the milk and massaging thoroughly each time, or apply a hot poultice (see Mammitis p. 303 and use lotions and ointments prescribed there). (4) If the udder darkens in color, rub in full strength mercurial ointment. (5) If gangrene start, bathe with 2 per cent solution of permanganate of potash twice daily.

Do not retain a ewe for breeding if anything has been wrong with her udder.

7. Red Water (Bloody Urine)

Symptoms. *Sheep or lamb stops eating, is dull, sick and may have either diarrhea or constipation. Dropsical swellings form on the belly and under the jaws, and ascites is sometimes present. The urine is red colored. The animal quickly dies.*

Cause. Irritants in feed; frosted roots or rape; acrid plants in wild pastures; damaged or moldy grain; injuries.

Treatment. Change feed to save rest of flock. Give syrup of iodide of iron in teaspoonful doses in a little water every 6 hours, increasing the dose if necessary.

8. Stoppage of Urine

Symptoms. *The sheep strains, arches its back and passes drops or dribbles of urine sometimes accompanied by blood; or urine is wholly retained. Weakness and dullness quickly follow, the bladder ruptures and the sheep dies. Dropsical swellings may form on the floor of the abdomen before death.*

Cause. Stone or gravel from the bladder, blocking the urinary passage (urethra); the stoppage of urine by gravel or a collection of limy substance in the sheath; heavy feeding on grain, bran, alfalfa, or roots, especially mangels.

Treatment. (1) Syringe and cleanse sheath with warm water containing 2 teaspoonfuls of coal tar disinfectant per pint. (2) Remove all collected matter, enlarging the opening of the sheath, if necessary, or even cutting off the worm-like end of the penis. (3) If unsuccessful, slaughter the sheep before the urine taints the flesh. Opening the urethra to remove gravel rarely saves the sheep, as other obstructions follow. Temporary relief may be given by drawing off the urine through a hollow needle inserted in the bladder.

When sheep show signs of such trouble, mix turpentine with their salt; allow them pine

boughs to gnaw; or give each one 10 grains of urotropin 2 or 3 times daily. Stop feeding materials listed as causes.

Infectious Diseases

9. Lip and Leg Ulceration—Necrobacillosis

Symptoms. *Ulcers, cankers or sloughing sores form upon the lips, head, chin, nose, cheeks, gums, hard palate, external genitals, or, less commonly, the legs.*

Cause. Invasion of cuts, wounds, or abrasions of the skin by a germ (*Bacillus necrophorus*) normally present in hog manure. The disease is passed from one animal to another, and is the direct cause of ulcerous sores of all animals.

Treatment. For the flock. Isolate sick sheep, examine others daily. Cleanse, disinfect, and whitewash sheds, pens, corrals, and yards (including walls, fences, feed troughs, etc.). Scrape up and remove manure and sprinkle ground with a 5 per cent solution of coal tar disinfectant. Pasture well sheep on clean ground. Infected pastures become safe after a winter.

For sick sheep. (1) Scrub and scrape all ulcers free from scabs and dead tissue and swab them very carefully with a solution of 1 part nitric acid and 7 parts water, or a 10 per cent solution of chloride of zinc. Touch only the sore spots. (2) Three times a week thereafter apply a mixture of 5 parts coal tar dip, 10 parts sulphur and 100 parts lard, lanolin, or vaseline. (3) Excellent results have come from swabbing with tincture of iodine; pure balsam of Peru is also recommended.

Foot Rot. Where large numbers of sheep have foot and leg ulcers (foot rot), remove all loose, rotten, and under-run horn, scrape ulcers clean, then run the sheep through a shallow trough containing a 5 per cent solution of coal tar dip. In obstinate cases use instead a solution of 1 pound sulphate of copper (bluestone) per gallon of water. Where sheep can be handled separately, trim the feet, drawing no blood if possible, and immerse them for a few minutes in a hot saturated solution of sulphate of copper. Afterward turn the sheep into a pen in which slaked lime has been spread 3 inches deep.

Prevention is most important. Keep quarters clean; start with clean sheep, then quarantine all newly bought animals for 2 weeks.



FIG. 382. Showing the ulcers resulting from lip and leg disease.

10. Hemorrhagic Septicemia—Cattarrhal Fever

A very infectious blood disease caused by a germ, *bacillus ovisepeticus*.

Symptoms. High fever, followed by loss of appetite, weakness, stiffness, trembling, paralysis and death. Bloody discharges may issue from the natural body openings. After death bloody spots are found under the skin and upon the lining of the intestines and surface of internal organs.

Treatment. Change flock to new pasture immediately. Isolate affected sheep. Burn carcasses of victims. Medicinal treatment fails but pasteurized vaccine, especially as an immunizing agent, may be tried by the veterinarian.

11. Sheep Pox—Variola

A disease akin to smallpox of man, caused by a germ too small to be seen even through a microscope. Sometimes malignant and very destructive.

Symptoms. Fever, loss of appetite, eruption of reddish pustules on bare skin on inside of fore and hind legs, external genitals, lips and underside of tail. The nodules rupture, discharge liquid and form scabs.

Treatment. (1) Separate sick from well sheep and maintain a strict quarantine. (2) Cleanse, disinfect, and whitewash pens. (3) Keep nostrils free from pus, injecting a little sweet oil, if they tend to clog. (4) Provide nutritious, succulent or laxative feed. (5) Apply a mixture of balsam of Peru 1 part, and alcohol 3 parts, or, a 2 per cent solution of carbolic acid and glycerine, to sores that heal slowly. (6) There is no medicinal treatment; disease must run its course.

12. Inflammation of the Womb—Metritis, Parturient Fever

Symptoms. Following lambing, a chill followed by high fever, distress, persistent lying down, suppressed milk secretion, reddish, bad



FIG. 383. A lamb showing the thin, poor, crazy condition resulting from having eaten the poisonous loco weed

smelling discharge from the vagina turning thick. The udder swells; vaginal membranes become inflamed and even ulcerated. Ascites (p. 318) may develop.

Cause. Tearing and infection of womb or retention of afterbirth; assistance with dirty or infected hands at lambing time.

Treatment. (1) Isolate the ewe and cleanse, disinfect, and whitewash her pen; burn the bedding. (2) Syringe out the womb with a solution of 1 dram of permanganate of potash per quart of blood-warm water at intervals of 12 hours, then with plain warm water. (3) Give alcoholic stimulants in thin oatmeal gruel to support strength and every 3 hours give 10 grains of salicylic acid in gruel. Two per cent carbolized oil poured into the vagina and womb after difficult lambing tends to prevent metritis.

13. Navel and Joint Disease

Resembles similar disease of foals and calves in nature, causes, etc.

Symptoms. The lamb droops, stops nursing, lies down, has fever, diarrhea, shows a clammy swelling at the navel from which pus may be squeezed; then hot, painful pus-filled abscesses form at the navel and joints and death results.

Treatment. Prevention is all important. Have lambs born in clean pens, or on grass; at birth saturate the stump of the navel with tincture of iodine, repeating once daily; dust the parts with slaked lime daily until the cord dries up and drops off or can be removed. When the disease is prevalent, disinfect the ewe's udder before the lamb is allowed to suck. Treatment of affected lambs is rarely worth while. (1) Paint navel and joints twice daily with tincture of iodine and liberate pus. (2) Support strength with stimulants in gruel. (3) Give 10 to 20 grains of triple sulphocarbolates 3 times a day in milk or raw egg.

Diseases of the Digestive System

14. Bloat

Symptoms. Left flank swollen and drumlike when tapped. The sheep breathes with difficulty, staggers and soon falls suffocated.

Cause. Gas in paunch or first stomach after gorging with green, wet alfalfa or clover, or grain.

Treatment. (1) If death threatens, tap paunch with a small trocar and canula as in cattle (p. 387). (2) Give 1 teaspoonful of turpentine shaken up in $\frac{1}{2}$ pint of new, warm milk (or 2 to 4 ounces of raw linseed oil). (3) If necessary to repeat, add a teaspoonful of aromatic spirits of ammonia. (4) A half-teaspoonful of formaldehyde may be substituted for the other medicines; new, warm milk alone is sometimes remedial.

15. Colic or "Stretches"

Symptoms. *Signs of pain (bellyache), restlessness, getting up and lying down, frequent stretching and straining causing "sway backed" position. Small quantities of slimy feces are passed. Not common in sheep but sometimes caused by drinking ice water or eating frozen feed.*

Treatment. Give a tablespoonful of sweet spirits of nitre and a teaspoonful of essence of ginger in a little warm water; or 1 ounce of gin in water. Twenty to 60 drops of laudanum may be added with benefit.

16. Constipation

Symptoms. *The sheep passes hard, dry, or mucus-covered feces with difficulty or in severe cases may stop defecating altogether.*

Cause. Prolonged feeding of coarse, dry, bulky, woody roughage, particularly timothy hay, marsh hay, weathered corn stalks, threshed clover hay, and frosted grass; lack of drinking water, laxative or succulent feed, and exercise.

Treatment. (1) Twice daily give 2 tablespoonfuls of glauber salts dissolved in 6 ounces of warm water, adding a teaspoonful of aromatic spirits of ammonia and 5 drops of fluid extract of nux vomica. (2) Give rectal injections of soapy warm water and glycerine 3 times daily. (3) If good results do not follow, give physic as for impaction (18, below).

This trouble is fatal to pregnant ewes; prevention is most important. Make them exercise daily; feed clover or alfalfa hay, 2 pounds roots or silage daily and a mixture of whole oats and wheat bran.

17. Diarrhea—Dysentery

Symptoms. *Feces discharged often or spasmodically in fluid or semi-fluid condition, straining, matting of the wool of tail and hind-quarters. The sheep stops eating and quickly becomes weak.*

Cause. Cold, wet, damp beds, spoiled feed, worms, or serious disease.

Treatment. (1) Find and remove the cause. (2) Give a 1 to 2 ounce dose of castor oil shaken up in milk. (3) Follow 3 times daily with 20 to 30 grains of subnitrate of bismuth in water or boiled milk, or 10 to 20 grain doses of triple sulphocarbonate tablets may be given. See treatment for worms (p. 324).

18. Impaction of the Rumen

Symptoms. *The sheep stops eating and chewing the cud, and the greatly swollen paunch in the left flank has a doughy feeling when handled. The animal may live for a few days, gradually growing weak; may become paralyzed before death.*

Cause. Paralysis of the walls of the

stomach from gorging with grain or any other feed, especially coarse, dry, bulky roughage.

Treatment. (1) Rumenotomy (p. 385) may be performed to save life, part of the feed being removed, and a solution of 4 ounces of epsom salts in a quart of warm water being poured into the paunch before sewing up the wound. (2) In less severe cases give a purge of 4 ounces of epsom salts, 1 ounce of salt, and 2 ounces of raw linseed oil in 1 pint of warm water, slowly and carefully from a bottle. (3) Follow every 3 or 4 hours with 1 dram of aromatic spirits of ammonia and 10 to 20 drops of fluid extract of nux vomica in 8 ounces of flaxseed tea, gradually increasing the nux if necessary. (4) Also give rectal injections of warm water and glycerine and gently knead the paunch with the palms of the hands.

When the third stomach is blocked ("grass staggers") the symptoms are practically the same as above. Treat as for stoppage of the bowels (p. 322).

19. Jaundice—"Yellows"

Symptoms. *Membranes, normally red, are stained yellow with bile; animal is thrifless. Most commonly occurs when the liver is infested with flukes (p. 324).*

Treatment (necessary when pregnant ewes or show sheep show staining). (1) Change to laxative or succulent feed and give increased exercise. (2) If not effective give glauber salts in water daily, $\frac{1}{2}$ to 2 ounces according to size of sheep and severity of attack.

20. Scours of Lambs

Symptoms. *The young lamb stops nursing and is very sick. Feces may be white or grayish-white, frothy and sometimes bad-smelling. If attacked practically at birth, as often is the case, the lamb goes down and soon dies.*

Cause. Ordinarily chill, cold, wet; poisonous milk of a ewe afflicted with garget (p. 318) or too heavy feeding just after lambing. In the most deadly form which is identical with calf cholera (p. 301) the cause is germs.

Treatment. Give 2 to 4 teaspoonfuls of castor oil in milk, then every 4 hours a raw egg beaten in milk, adding 10 grains of subnitrate of bismuth and 5 grains of salol; or give 10 to 20 grains of triple sulphocarbonate. Prevention is most important: (1) Saturate the stump of lamb's navel with tincture of iodine at birth. (2) Disinfect the ewe's udder before lamb is allowed to suck. (3) Feed ewe carefully on sound feed, and keep her off grass and feed dry hay if her lamb scours.

21. Sore Mouth—Stomatitis

Sheep, like cattle, may be affected with either simple, mycotic or necrotic stomatitis (p. 300). Symptoms and treatment are the same as given there.

22. Stoppage of the Bowels

Symptoms. *The sheep stops eating and chewing the cud, lies down, but rises often and strains ineffectively for passage of feces.*

Cause. Same as in impaction; also commonly frosted grass. Insufficient water and succulent or laxative feed contribute.

Treatment. (1) Give rectal injections and knead the abdomen. (2) Give every 3 hours a drench of 8 ounces of warm flaxseed tea containing 1 teaspoonful of aromatic spirits of ammonia, 10 to 20 drops of fluid extract of nuxvomica, and 2 teaspoonfuls of alcohol. If a stone, wool ball or gut-tie is the cause, treatment is useless.

Diseases of the Breathing System

23. Bronchitis

Symptoms. *Moist cough; discharge from the nostrils tending to become rusty; in acute cases fever and lack of appetite. Tends to run into fatal pneumonia or may assume a chronic form with persistent cough.*

Cause. Follows catarrh or sore throat. Also irritating gases in dirty, badly ventilated stables; exposure to wet and cold; lung worms (p. 325). Common in lambs turned out too soon on wet grass.

Treatment. (1) Give fever mixture No. I (p. 372) in 1 to 2 tablespoonful doses every 3, 4, or 6 hours; increase doses, if necessary. (2) If appetite is poor, or sheep weak, add 2 teaspoonfuls of sweet spirits of nitre. Both can be given in thin oatmeal gruel. Glyco-heroin in doses of 2 to 4 teaspoonfuls has given good results.

24. Catarrh—Cold—Snuffles

Inflammation of the lining membranes of the passages of the head to which sheep are very susceptible. They cannot stand wet, damp beds, exposure, or crowding in dirty, hot barns. Grubs in the head (p. 323) also are a common cause.

Symptoms. *Sneezing, coughing, discharge from the nostrils; sheep may lose appetite; membranes of the eyes are red.*

Treatment. (1) Remove the cause and sprinkle a little chloride of lime on the floors. (2) In severe cases steam the head with oil of eucalyptus in hot water. (3) Give 1 teaspoonful of sweet spirits of nitre in a little water or thin gruel 3 times daily. (4) Add a teaspoonful of glyco-heroin, if cough is troublesome and increase dose, if necessary. (5) Treat severe cough like sore throat (p. 274).

25. Pleurisy

Symptoms. *Those of bronchitis; also grunting, pain, stiffness, and heaving of the flanks with the chest walls held rigid. As fluid forms in the chest cavity breathing becomes labored; the sheep dies of suffocation in a week to 10 days.*

Cause. Exposure to cold, driving winds; wetting from washing or swimming; may complicate attack of pneumonia.

Treatment. (1) Give 2 to 4 teaspoonfuls of whiskey or brandy in water every 3 or 4 hours at outset, and salol in 20 to 30 grain doses twice daily. (2) If disease progresses give fever mixture No. II (p. 372) followed by teaspoonful doses of iron and quinine tonic mixture (p. 372) in water, when fever abates.

26. Pneumonia

Symptoms. *Chill followed by fever, lack of appetite, deep cough, labored breathing, heaving flanks, elbows turned out, membranes light red at first, but may turn dark red. Cud chewing ceases. Discharge from nostrils may become bad-smelling; the teeth are gritted with pain, and the sheep soon weakens and dies.*

Cause. Those of catarrh; also lung worms in lambs.

Treatment. (1) Place the sheep in a comfortable pen, stove heated if possible, in cold weather. (2) Give fever mixture No. II, adding whiskey freely, if sheep is weak; glyco-heroin in 2 to 4 teaspoonful doses also is helpful. (3) Blanket chest snugly with flannel from the outset. (4) Support strength with milk, raw eggs and thin flaxseed gruel, if appetite is poor.

27. Sore Throat—Laryngitis

Symptoms. *Fever, fast breathing, head stuck out, mouth open, cough, difficulty in swallowing; feed and water return through the nose.*

Treatment. (1) Clip the wool from the



FIG. 384. A lamb infested with ticks, showing roughened condition of fleece (Farmers' Bulletin 798)

throat. (2) Rub in "white liniment" (p. 372) twice daily. (3) Give 1 teaspoonful of electrolyte (p. 372) 2 or 3 times daily. (4) In severe cases poultice with hot flaxseed meal. (5) Allow fine, wet hay or grass. Pen sick sheep in a clean, airy place.

Parasites and Diseases They Cause

28. Lice

The sheep louse is a common cause of considerable irritation; it is about one twenty-fifth of an inch long, white with reddish brown head. Lice are found chiefly on the sides of the neck and inner part of the thigh; symptoms are rubbing and scratching. They are easily destroyed by dipping; if this cannot be done dust parts with a mixture of pyrethrum powder, tobacco, and sulphur.

29. Ticks

The tick is very common, 6-legged, of a mottled brownish color and about one-quarter of an inch long. It spends its entire life on the sheep's body, sucks blood, and causes great irritation and damage. Ticks may even stunt the growth of lambs to which they migrate at shearing time. They are easily destroyed by dipping in a solution of any standard dip; a second dipping 2 weeks later destroys young ones, newly hatched from eggs or "nits." In winter "insect powder" applied freely may help. In either case cleanse and disinfect pens at the same time.

30. Scab, Mange, Itch

A skin disease caused by the very small roundish, 8-legged scab mite, which can be seen with the naked eye if scabs from an

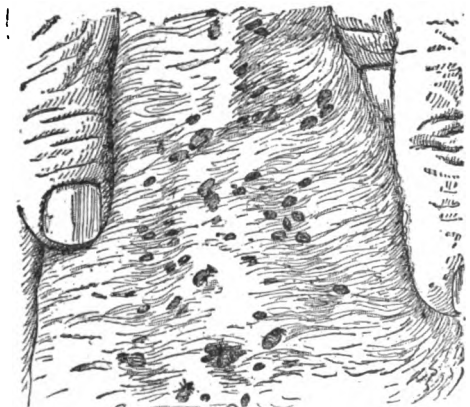


FIG. 385. Close view of fleece pulled apart to show ticks of different ages. (Farmers' Bulletin 798)

affected part are spread on black paper in the sun. The mites cannot live long away from sheep but they will multiply with amazing rapidity and the eggs, which are almost indestructible enable the disease to remain in infected places almost indefinitely.

Symptoms. *Sheep start biting, scratching, and rubbing; the wool becomes "laggy" and falls out in patches; the condition spreads rapidly through the flock. Examination of the skin shows small inflamed spots, which enlarge and discharge serum which dries and forms scabs or crusts in which the mites live. As the disease grows worse the sheep becomes thin, weak, and a mass of scabby patches from which the wool hangs in shreds or has entirely fallen.*

Treatment. (1) Dip in lime-sulphur mixture (p. 371), keeping the sheep under for at least 2 minutes and immersing the head once for a second. Repeat 3 or more times at 10-day intervals. Sheepmen have objected to this, which they say injures the wool and eyes. Commercial and coal tar dips are effective but it is well to add 16½ pounds of sulphur to each 100 gallons of coal tar dip solution. (2) When treating only a few sheep, shear them, remove scabs by scrubbing affected parts, and pour on and rub in the dip solution. (3) Thoroughly clean, disinfect, and whitewash pens, houses, yards, racks, fences, and rubbing places.



FIG. 386. An early sign of sheep scab. Wool beginning to drop off in patches. (Farmers' Bulletin 713).

31. Grub in the Head

Symptoms. *Discharge from nostrils, profuse, thick, often blood stained; red, inflamed membranes of nose and eyes. Sheep sneezes, coughs, tosses head about and backward, stamps, sometimes becomes giddy and staggers. Distress leads to loss of flesh, and sometimes paralysis and death.*

Cause. Presence of larvae or grubs of the Sheep Gad Fly (*Estrus Ovis*) in upper head passages and cavities. The small larvae (not eggs) are deposited in the nostrils during fly time and gradually work upward. They become three-quarters of an inch long and provided with sharp spines which cause intense irritation. After about 10 months in the head cavities the grubs pass out, burrow into the ground and after 4 to 6 weeks as pupae come out as flies; some grubs may fail to leave the head. When sheep hear the fly (which is yellowish gray with 5 rings on the abdomen, white under the head and slightly larger than the housefly), they thrust their noses into the

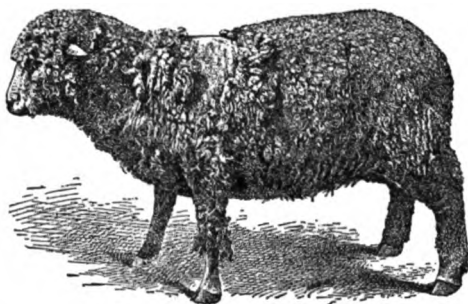


FIG. 387. A severe case of scab showing the increased shedding of wool from all parts of the body

ground or against each other's bodies and try to protect themselves against it.

Treatment. There is no effective remedy. Trephining (p. 387) to remove grubs scarcely pays. To prevent: (1) Smear a mixture of pine tar and grease on the sheeps' noses in summer; or make them do it by putting the tar about holes bored in a log and filled with salt. (2) Drive sheep along dusty roads at fly time. Some shepherds blow snuff or pour a little turpentine or kerosene and oil into the nostrils.

31a. Gid, Sturdy, or Turnsick, common in Europe, but rare in this country, is caused by the presence of "hydatids," or the larval form of the tape worm of the dog, in the sheep's brain. The animal pines away, keeps turning in circles, finally goes down and dies.

Treatment. Hydatids, if on the surface of the brain, may be removed by trephining. Keep sheep dogs free of worms (p. 353) and do not allow them to eat heads of dead sheep.

32. Liver Rot—Liver Flukes



FIG. 388. Bag for dipping sheep where a permanent pit or tank is not desired. (Farmers' Bulletin 713)

A disease of the liver caused by the Liver Fluke, a flat, reddish, leaf-like parasite, common in Europe and found in some of the Southwestern states. It is restricted to low, wet lands since one stage of the life of the parasite is passed in the body of the water snail. By swallowing an infested snail a sheep contracts the disease and at first fattens then shows yellow staining of the skin and mucous membranes, harsh wool, dropsi-

cal swellings, increasing loss of flesh, and weakness ending in death. If its liver is cut and squeezed the flukes appear in its ducts (tubes).

Treatment is useless. Prevent by avoiding low, wet pastures, allowing free access to salt, and feeding generously.

33. Maggots

The maggots of the screw worm fly, the blow fly or bluebottle fly and the flesh fly do great damage to sheep by burrowing in sores, wounds, and skin soiled with diarrhea discharges.

Treatment. Clip off the wool, cleanse the skin, and saturate the wound or sore with a mixture of 2 ounces of flowers of sulphur, $\frac{1}{2}$ ounce of oil of tar, and 1 pint of raw linseed or cottonseed oil; or a 1 to 50 solution of coal tar dip. Apply pine tar freely as a preventive to all fresh wounds and sores, also after destroying maggots. Keep sheep free from soiled wool.



FIG. 389. Brain of giddy sheep showing gid or bladder worm *a* and its tapeworm heads *b*, which if eaten by a dog, develop into tapeworms and infect other sheep. (Bulletin 260, U. S. Dept. of Agr.)

Worms

34a. Stomach worm. A hair-like, pinkish-white blood sucker, about an inch long. It often attaches to the mucous membrane, inhabits the fourth stomach in great numbers, and may be found in the intestines. Eggs pass from the droppings of infested sheep on to the pasture, hatch and are taken in again by other grazing lambs and sheep. Lambs are most likely to become infested on old, permanent and low, wet pastures long used by sheep.

Symptoms. *Diarrhea, loss of flesh, weakness, bloodless appearance (pallor) of the skin and eye membranes. Lambs may be pot-bellied and finally show dropsical swellings under the jaws and belly; many die. Old sheep suffer less but spread the trouble.*

Treatment. (1) Starve the sheep or lamb for 12 to 18 hours. (2) Slowly and carefully, from a bottle having a piece of rubber hose fitted on its neck, pour into its mouth, a little at a time, 1 tablespoonful of gasoline shaken up in a mixture of 2 tablespoonfuls of raw linseed oil and 8 to 10 tablespoonfuls of new milk, holding the animal steady on all-fours, not on its rump. Take great care to prevent choking. For an adult sheep increase the gasoline one third. (3) Repeat the dose on

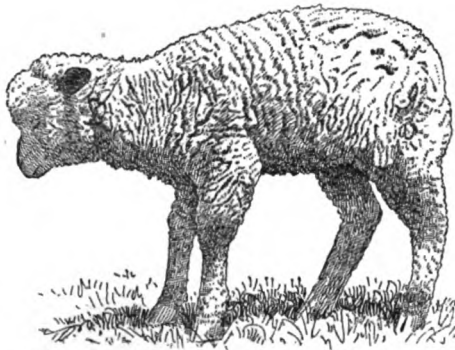


FIG. 390. A sheep infested with stomach worms

3 successive mornings. (4) Give lambs clean drinking water, new grass fields each spring and frequent change of pasture if possible.

34b. Tape worm. A common species 3 to 6 inches long, with a sucker head, long, wide segments, and a second much longer form. They inhabit the small intestines and are contracted from contaminated feed and water.

Symptoms are similar to those of stomach worm. Chronic diarrhea especially is persistent. **Treatment.** (1) Starve 12 hours or more, then very slowly give 1 to 3 drams of freshly powdered kamala in 3 ounces of milk or gruel. (2) If not effective, give, in 10 days, 1 dram of ethereal extract of male shield fern and 2 ounces of castor oil in milk. Give lambs one quarter to three quarters of this dose according to age and size.

34c. Lung worm. A white, thread-like worm, pointed at the ends, 2 to 4 inches long (female), inhabiting the air passages of the lungs and causing the disease *Verminous Bronchitis*.

Contracted in the same way as stomach worms and cause great losses in some districts.

Symptoms. Croupy cough, discharge from the nose; gradual loss of flesh and weakness; "paper skin" and blanched membranes; diarrhea. **Treatment.** Fumigate with burning sulphur, or iodine vaporized on a hot brick, under a veterinarian's supervision; he may also inject medicine into the windpipe, but such measures are seldom satisfactory. To prevent, feed generously;

keep lambs off old grass and away from contaminated water.

34d. Nodular worm. White, thread-like; from three quarters to 1 inch long. When hatched from eggs the worms penetrate the mucous membrane of the intestine and produce nodules (bunches) filled with yellowish-green, cheesy material—the Nodular Disease of the Intestines or "Knotty Guts." The only definite symptom is, perhaps, a slight constipation. **Treatment.** Adult worms in the intestines may be killed with gasoline as for stomach worms (p. 324) but there is no remedy in the nodular stage.

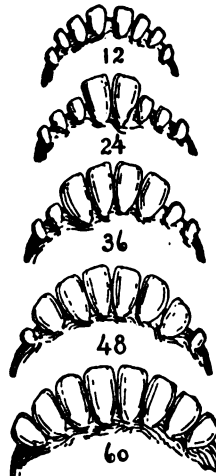


FIG. 391. The teeth of the goat viewed from the outside at different ages, the figures indicating months.

Prevent like stomach and tape worms; allow sheep and lambs free access to salt, or a mixture of 1 part powdered tobacco leaves to 9 pounds of salt.

CHAPTER 29

Common Diseases of Swine

By DR. A. S. ALEXANDER, Professor of Veterinary Science, University of Wisconsin. Judging by the miserable, filthy conditions under which great numbers of hogs are kept, they would appear to be remarkably free from, and resistant to, disease. As it is they respond just as generously to care and attention as any other animal. Unfortunately the average sick hog is given but scant attention, and rarely receives either treatment by a veterinarian or careful, thorough examination and doctoring by the farmer. In view of the modern values of all kinds of meat, the economy of pork as a farm product, and the rapidity and regularity with which swine can increase the size and value of a herd, it is very poor policy thus to neglect them. With the information and directions supplied in this chapter, such neglect is neither necessary nor excusable.—EDITOR.

ALTHOUGH the modern pasture methods of feeding swine place the animals in the *herbivorous* (plant eating) class, they are really part way between this group and that of meat eaters (*carnivora*) as far as their digestive system is concerned. The appetite for meat food sometimes indicated by the pig-eating habit is generally satisfied by feeding tankage, blood meal, etc. The feeding of dead rats and other carcasses to swine is unnecessary and unwise.

The stomach is in one part, like that of the horse, the intestines are rather short (about 77 feet), and the digestive process takes place much more rapidly than in the ruminating animals. The hog has 44 teeth or more than any other farm animal; there are on each jaw, 6 nippers, 2 tusks, and 14 grinders. They are not used in telling the age of the animals, the ear mark or other method of indi-

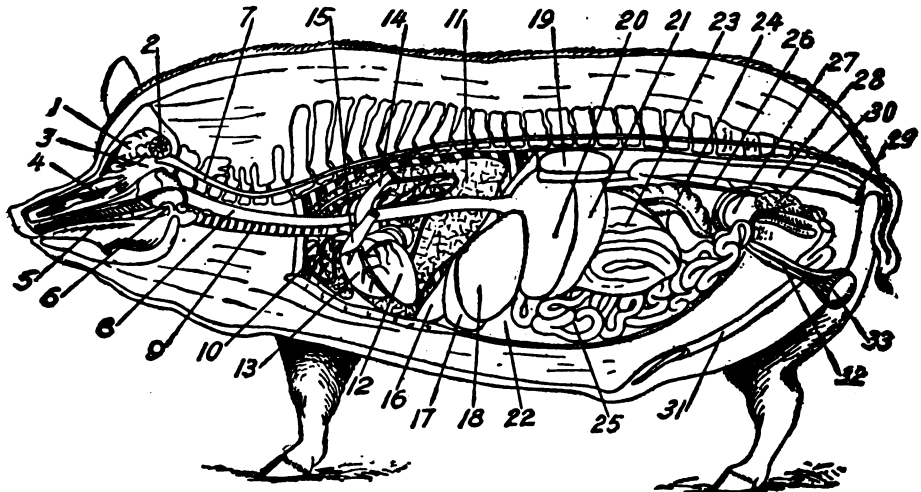


FIG. 392. The pig's body and its important parts. 1, 2, 3, parts of brain; 4, cavities in skull; 5, tongue; 6 pharynx; 7, spinal cord; 8, gullet; 9, windpipe; 10, bronchi; 11, right lung; 12 and 13, heart; 14, aorta; 15, artery to lungs; 16, diaphragm; 17, 18, lobes of liver; 19, kidney; 20, stomach; 21, spleen; 22, abdominal cavity; 23, colon; 24, caecum; 25, small intestine; 26, ureter; 27, bladder; 28, rectum; 29, anus; 30, prostate gland; 31, penis; 32, tube from testicle to penis; 33, testicles.

cating the litter to which any animal belongs giving this information accurately enough for practical purposes.

The heart beats, as in sheep, occur at the rate of 70 to 80 per minute; the normal temperature is 103 degrees F.; and the number of respirations per minute are 10 to 15. Most animals keep cool by sweating, the evaporation of the moisture so produced lowering the body temperature. Since the hog sweats only on the snout, it feels the heat severely and requires either shade, occasional sprinkling, or a pool to wallow in during the hottest weather. Having but little hair, the skin of hogs, especially white ones, is rather liable to sun scald.

The breeding age of swine actually begins at 6 months but practically at 9 or 10. Heat periods lasting 1 to 3 days occur at intervals of 3 weeks and 3 to 9 days after farrowing. Pigs are carried for about 112 days, extremes ranging from 104 to 143.

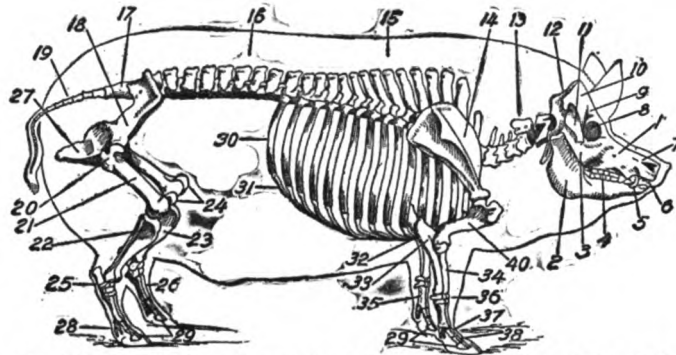


FIG. 393. The pig's bony framework. 1, upper jaw; 2, lower jaw; 3, 7, 9, 10, 11, 12, parts of skull; 4, molars; 5, tusk; 6, incisors; 8, eye socket; 13, cervical (chest) vertebrae; 14, scapula (shoulder blade); 15, dorsal (back) vertebrae; 16, lumbar (loin) vertebrae; 17, sacrum; 18, ilium; 19, caudal (tail) vertebrae; 20, hip joint; 21, femur (thigh); 22, fibula, and 23, tibia (leg bones); 24, patella (knee pan); 25, tarsal bones; 26, metatarsal bones; 27, ischium; 28, dew claws; 29, coffin bone; 30, ribs; 31, rib cartilage; 32, sternum; 33, ulna, and 34, radius (arm bones); 35, metacarpal bones; 36, carpal bones; 37, cannon bones; 38, coronet bones.

Index of Symptoms

(Numbers refer to diseases discussed in this Chapter; the letter B refers to Hog-cholera treated separately in Chapter 35, p. 399.)

Abdomen	tucked up—B	Eyes	appear blind—13
Anus	Red mass protrudes from—10, 16		Eyelids covered with discharge—B
Appetite	depraved—17 irregular—19 Loses—8, 18, 20, 22, 23, 24, 25, 29-B	Face	Membranes become yellow—6 bones enlarge—28 muscles jerk—3
Back	arched—18-B	Fails to Breed	2
Bones	Enlarge at ends, sometimes break—12	Fails	13-B and stiffens—3
Breathing	difficult—24, 25, 29 jerky—26 labored—27-B	Fever	8, 18, 23, 24, 25, 27, 29-B
Chest	filled with fluid—26 sore—26-B	Flanks	heave—26 jerk—15
Coat	staring—21	Head	jerked, or carried to one side—13
Collapse	Dies after sudden—5	Heat	Fails to come in—2 in joints—8, 11 in sheath—4 periods irregular or persistent—2 Pregnant sow shows signs of—1
Constipated	6—19-B	Hindquarters	drag—9
Cough	24—26, 27, 29, 33-B	Indigestion	acute—19
Drools	22	Itches	31
Droops	20	Jaws	Champing of—3, 22
Difficult	breathing—24, 25, 29 urination—4		
Digestion	deranged—6, 33-G		
Distress	27		
Eats	bones, dirt, manure, pigs—17		

Joints	hot, painful, pus in— 8, 11	Rubs and Scratches	80—81
Lameness	swollen—8, 12	Scours	18, 19, 20, 21-B
Legs	9, 26-g shifting—11 bend—12	Sheath	swollen, hot, painful; discharge from— 4
Lies by Itself	Hind legs crossed—B 18	Sick	20
Lips	Ulcers on—23	Skin	hot and dry—5 moist, dirty, purplish red, around ears, under body—B
Manure	Hogs eat—17 hot, dry, or clay col- ored—16 liquid, blood stained, foul smelling— 21-B pale or stinking—6 soft or liquid, grayish- colored, smelling —20		Red swellings on ears, neck and legs— 31 scurfy and scabby— 30
Milk	clotted, watery, or bad smelling—7	Sneezes	25, 28
Mouth	Bad odor from—22 Froths at—3 Sores in—22 Ulcers and raw patches on gums —23	Snout	enlarged, bulging—28 bones swollen and dis- torted—12, 23 thickened—25 Ulcers on—23
Navel	Abscesses with pus at —8	Staggers	5, 13-B
Nostrils	Thick discharge from —28 Membranes dark red —27 Rusty discharge from —27 Watery discharge, be- comes thick—25	Stiffness	3, 9, 11
Pain	11, 18, 29 in chest—B in sheath—4 9, 15	Swallows	with difficulty—29
Paralysis	12	Swelling	in joints—8, 12 sheath—4 udder—7
Pasterns Break Down	cannot be extended— 14	Tail	Red, on skin—31, 32 shifts—11 droops—18
Penis	Sow eats—17 33a	Thin	20
Pigs	weak—27	Throat	swollen—29
Pot Bellied	in abscess at navel—8	Udder	swollen, red, painful —7
Pulse		Ulcers	on gums—23 on skin of abdomen— B
Pus		Unconscious	Becomes—5, 6
		Urine	high colored—B
		Vagina	Discharge from—2 Bloody discharge from —1
		Vomiting	6, 18, 19-B
		Weakness	15, 21-B

General Diseases

1. Abortion

Symptoms. *Premature (ahead of time) birth of young either living or dead may suddenly occur in the early stages of pregnancy without warning symptoms, or the sow may appear to come in heat, show a bloody or unnatural discharge from the vagina and then expel her pigs. More commonly all the signs of approaching farrowing are seen.*

Cause. While infection from germs may cause abortion in sows as in cows, it rarely does so. Usually the cause is an accident or injury of some kind, crowding, squeezing, kicks,

blows, shipping, shock, chill, or attacks of indigestion or serious disease. Constant drug-ging of pregnant sows, especially with copperas, turpentine, and other strong medicines, is a very common cause, as is the excessive allowance either of plain or medicated salt or the feeding of dirty or fermenting slop or moldy or damaged feed of any kind.

Treatment. Avoid, where possible, all causes of shock or derangement of the digestive organs. *Medicinal treatment.* When it is seen that abortion is about to occur, give 1 tea-spoonful each of laudanum and fluid extract of blackhaw every 3 or 4 hours until the sow

becomes quiet; then stop the laudanum and continue the blackhaw twice daily until all symptoms subside. If abortion occurs burn the pigs, isolate the sow, and whitewash the pens. The sow should, as a general rule, be fattened and sold for slaughter.

2. Barrenness

Symptoms. *In some instances sows fail to come in heat and so cannot be bred; in others the periods of heat are normal but repeated breeding fails to affect conception. In a few cases the periods of heat may be irregular or persistent and in some sows there is an abnormal discharge from the vagina.*

Cause. Fitting for show, pampering by overfeeding, excessive feeding of corn, and lack of exercise are the commonest predisposing causes. The generative organs become overloaded with fat and consequently degenerate; or acid secretions destroy the sperm cells of the male. Insufficient feeding, germ infection of the organs and results of cholera also may cause barrenness. In some instances the female is born barren; is too closely related to the boar; is sexually imperfect and sterile; or the vagina is obstructed or the mouth of the womb abnormally closed.

Treatment. (1) Reduce fat by exercise and spare feeding; or build up thin, weak sows by generous feeding. (2) Slaughter for meat sows otherwise healthy but having irregular or persistent periods of heat. (3) Induce periods of heat where lacking by giving 12 drops of fluid extract of damiana once a day in a little slop. (4) Use yeast mixture (p. 373) if other measures fail or if an abnormal discharge is seen. (5) If that too fails inject 2 or 3 times a week lukewarm water containing 1 teaspoonful of pure phosphate of soda per quart. (6) If the vagina is obstructed or the womb abnormally closed have a veterinarian operate.

Prevention. Avoid in-and-in breeding; enforce active exercise during growth; provide mixed rations as suggested for rickets (p. 331). Do not dope swine with condition powders or stock feeds. Keep the young sows muscular, free from excessive fat and active; prevent constipation.

3. Epilepsy—Fits

Symptoms. *The pig comes to the trough, takes a few mouthfuls, shows jerking of face muscles, champs its jaws, froths at the mouth, falls, passes urine and feces, stiffens out, then recovers in a few minutes. Attacks may occur frequently or at long intervals; some are comparatively mild.*

Cause. Derangement of the brain set up by indigestion and irritation from worms or teething, also those of staggers (p. 331).

Treatment. (1) Treat little pigs for worms after giving a dose of castor oil. (2)

Slaughter adult hogs that are in good flesh. (3) At time of attack give 20 to 60 grains of bromide of potash in water and repeat in 20 minutes, if necessary.

4. Foul Sheath

Symptoms. *Collections of claylike matter and filth block the sheath and its folds. Swelling, heat and pain, difficulty in urinating, discharge of bad-smelling fluid or matter when parts are squeezed. Retention of urine may result; inflamed parts may become infected by germs.*

Cause. Filthy quarters, dusty beds and pens; lack of exercise; ill-thrift from any cause.

Treatment. (1) Cast the hog. (2) Bathe sheath with warm water. (3) Syringe out with warm water containing $\frac{1}{2}$ teaspoonful of permanganate of potash per quart. (4) Remove



FIG. 394. A concrete hog wallow often prevents injury from heat but it must be kept clean to be sanitary

all collected matter, using a knife, if necessary, to enlarge the opening. (5) Smear an ointment of 1 dram of iodoform and 2 ounces of lard in the sheath. (6) Repeat treatment daily, if necessary.

5. Heat Prostration

Sun-stroke or heat-stroke often attacks fat hogs in hot weather when being driven to market or when chased by dogs, crowded in railroad cars, exposed in cramped quarters or in pastures lacking shade or water.

Symptoms. *In acute attacks death occurs after sudden collapse; in milder cases the hog weakens and staggers, shows hot, dry skin, goes down and becomes unconscious.*

Treatment. Bathe the head and neck with cold water, allow whiffs of ammonia and give whiskey, alcohol or aromatic spirits of ammonia in 1 to 2 teaspoonful doses in water once an hour. Prevent by providing abundant drinking water, a bathing pool or "wallow," and shade in pasture; keep fat hogs quiet in hot weather; place a big pile of ice in the centre of the railroad car or wet the hogs frequently when shipping.

6. Jaundice, "Yellows" (Icterus)

Symptoms. *White membranes of the eyes become yellow from absorption of bile from the liver; constipation or vomiting; feces pale in color or stinking; other signs of deranged diges-*

tion; in severe attacks unconsciousness and death.

Cause. Obstruction of bile ducts by gall stones or round worms; disease of the liver from any cause.

Treatment. (1) Enforce active exercise and feed light, laxative slop containing small doses of raw linseed oil or glauher salts to relax the bowels. (2) In acute cases give a full dose of glauher salts (4 oz.) and repeat in 4 or 5 days. (3) Give worm medicine, if worms have been seen. (4) Correct indigestion by treating for symptoms shown.

7. Garget (Mammitis)

Inflammation of the udder, caused by chill, bruises, wounds by the pig's teeth, incomplete removal of milk, infection, disease of the womb, overfeeding of protein-rich feed, difficult farrowing.

Symptoms. *The udder becomes swollen, red and painful and the milk clotted and wheylike, or changed to a bad-smelling, watery fluid.*

Treatment. (1) Reduce rich feed. (2) Physic by mixing 4 ounces of epsom salts in slop. (3) Strip out the milk 3 times daily, fomenting the udder with hot water and massaging gently but thoroughly at each milking. (4) Rub in a mixture of 1 teaspoonful each of turpentine and fluid extracts of belladonna leaves and poke root and 5 of lanolin, melted lard, or sweet oil twice daily. In severe cases wean the pigs. After weaning never allow access to the sow again. Gargety milk, and milk a few days after weaning, often proves deadly to pigs.

Sores on teats are healed by applying benzoated oxide of zinc ointment twice daily, or other sore teat applications (p. 307).

8. Navel and Joint Disease

Symptoms. *Pus collects in an abscess at the navel, then in the joints which become swollen, hot and painful; lameness; fever; loss of appetite; death in a few days.*

Cause. Germs from filthy floors and beds infect the raw stump of the navel and cause the formation of pus which is carried by the blood stream to the joints and internal organs.

Treatment. Treatment is practically useless; prevention is all-important. (1) Provide



FIG. 395. A pig affected with paralysis

light, airy, clean, disinfected, whitewashed, fresh bedded farrowing pens. (2) Saturate the navel at birth with tincture of iodine, then apply slaked lime daily and use tincture again, if navel dries slowly.

9. Paralysis

Symptoms. *The pig or hog gradually becomes stiff and lame, eventually "goes down behind" and drags its hind quarters about; adult swine may suddenly become paralyzed.*

Cause. Confinement, constipation, lack of lime in feed, stuffing with corn (which is poor in bone-building materials), overfeeding protein-rich rations, worms, drain and strain of suckling pigs, injuries to the spine or muscles of the loin or abscess in that region. Kidney worms are not the cause. A tendency to it is hereditary. Paralysis may be a symptom of cholera or other disease. Rickets (p. 331) commonly is present.

Treatment. (1) Give 4 to 6 ounces of glauher or epsom salts in water or slop as a purgative and follow with sloppy feed containing raw linseed oil; physic little pigs with castor oil; free movements of the bowels are imperative. (2) Rub loins daily with white liniment (p. 372). (3) Give increasing doses of tincture of nux vomica 3 times daily, starting with 3 drops the first day. (4) If not quickly effective, add 10 grains of iodide of potash to each dose of nux. (5) Wean pigs, if sow is nursing. (6) If otherwise healthy fat hogs do not quickly recover when given a physic and laxative slop, slaughter them for meat.

Prevention. Make every pig and adult hog exercise every day; feed milk and mixed meals; always combine alfalfa or clover hay and green feed with a grain diet; allow free access to slaked lime, wood ashes, and wood charcoal. If paralysis or rickets is prevalent, feed digester tankage from a self-feeder and daily mix bonemeal or precipitated phosphate of lime in the feed. Add limewater freely to milk or slop fed to pigs. Feed but little corn to boars, pregnant and nursing sows, and small pigs. Keep hogs free from worms.

10. Prolapse of the Rectum, "Piles"

Symptoms. *A small or large red mass protrudes from the anus, gradually darkening in color. Rubbing, injury, exposure and infection of wounds may eventually cause gangrene and sloughing. Pigs fail to thrive. Death may result.*

Cause. Constipation, worms, irritation from cinders, sand, earth or other foreign bodies swallowed by hogs affected with depraved appetite from indigestion; prolonged feeding of bran, unscreened ground oats, barley, or boiled potatoes. Hulls of grain and ground corn cobs also are irritative causes.

Treatment. Avoid causes mentioned. (1)

Physic with castor oil or epsom salts and follow with thin slop containing a little raw linseed oil. (2) Cleanse protruded parts. (3) Wet them with fluid extract of ergot, or dust with freshly powdered ergot, or bathe with soft water containing 1 tablespoonful of powdered alum per pint. (4) Work parts into place. (5) Bring tail down between hind legs and tie there for 24 hours with a tape carried around the body. (6) If this plan fail, place a stitch across the opening of the anus. (7) Cut off any sloughing parts. It often pays best to slaughter the animal for meat, if in fit condition.

11. Rheumatism

Symptoms. *Affected parts (both muscles and joints) are so painful that the animal squeals when handled. Soreness, swelling, stiffness or lameness tend to shift from place to place. Other symptoms are like those of navel or joint disease rickets or paralysis.*

Cause. Not fully determined, but exposure to wet, dampness, and cold, insanitary surroundings, derangements of the digestive organs and germ infection are suspected.

Treatment. (1) Provide dry, sanitary beds and living quarters. (2) Feed light, laxative slop. (3) Blister swollen painful joints (p. 371). (4) Give salicylate of soda in 15 to 60 grain doses in slop 2 or 3 times daily according to size of pig and severity of attack.

12. Rickets

Symptoms. *Enlargement of the ends of the bones; swelling of joints; bending of the legs, sometimes breaking of the bones; swelling and distortion of the bones of the snout ("bullnose" associated with "snuffles," p. 334); breaking down of the pasterns; ill-thrift; paralysis.*

Cause. Lack of mineral matter in the bones, the reason not being definitely determined. Imperfect nutrition is evident. Lack of lime in feed, failure to deposit lime in the bones; borrowing by the body of lime from the bones; worms; lack of exercise; unbalanced rations; insanitary surroundings; and hereditary influence, may all be to blame.

Treatment. (1) Give lime freely in the form of chalk, limewater, or slaked lime, or mix bonemeal or precipitated phosphate of lime, or "floats" in the feed. (2) Allow free access to wood charcoal and wood ashes. (3) Infuse fresh blood by using strong, non-related boars from a different district. Practise preventive measures advised under paralysis.

13. Stagers (Vertigo)

Symptoms. *The hog staggers, goes in a circle, appears blind, and falls. The head may be jerked or carried persistently to one side. Symptoms persist. Turning may be in one direction only.*

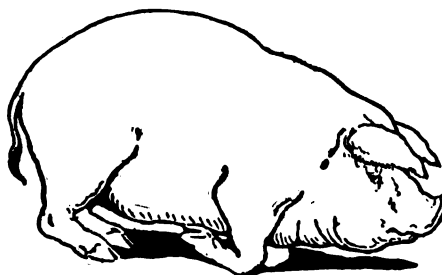


FIG. 396. A pig affected with rickets

Cause. Brain derangement, usually the result of indigestion, but may be caused by an injury or pressure upon the brain from a clot, tumor, abscess and, more often, the bladder form (hydatid) of a tape worm. (Fig. 389).

Treatment. Pressure upon the brain is incurable. In ordinary cases treat for indigestion and worms and regulate the diet; maintain sanitary conditions; allow active exercise.

14. Sterility

Symptoms. *The boar may be unable to get sows with pig or protrude the penis, or to perform or complete service.*

Cause. See Barrenness, p. 329. Also vaccination against cholera which may injuriously affect the testicles, or an attack of cholera which may leave the boar sterile; injuries to the penis, over service, too early service, old age or too long abstinence from service. Rickets unfits a boar for service.

Treatment. Where possible remove causes. Encourage daily exercise, maintain muscular development, prevent constipation and over-fat condition. A teaspoonful of fluid extract of saw palmetto, or Sanmetto, given 3 times daily may help. Use a breeding crate.

15. Thumps

Symptoms. *Jerking of the flanks, accompanied by noise and, in severe cases, backward and forward motion; most seen after meals and when pig is standing. Exercise intensifies the distress. The pig usually is weak, thrifless and stunted and lives from a few days to 2 or 3 months.*

Cause. Overfeeding (the over distended stomach presses upon the diaphragm—partition between chest and abdomen); lack of exercise. Pigs of pampered stock are most susceptible.

Treatment. (1) Give a dose of castor oil or epsom salts to clear the bowels. (2) Give 8 to 15 drops of laudanum or 20 to 60 drops of paregoric once an hour until spasms are relieved. (3) Enforce active exercise and allow green feed and nourishing, laxative slop containing 1 ounce of limewater per quart.

Palpitation, or violent beating of the heart, presents similar symptoms, sometimes arises from indigestion and is relieved by a dose of physic, rest and reduced rations.

Diseases of the Digestive System

16. Constipation

Symptoms. *Feces are hot, dry, often clay-colored and slimy, and passed with pain and difficulty. The hog is dull, loses appetite and does not exercise. Prolapse of the rectum often occurs.*

Cause. In pregnant sows, stuffing with corn and allowing absolute idleness toward the end of pregnancy; the condition is harmful or deadly to sows and pigs alike. Prolonged feeding of concentrated or irritating feed; lack of exercise; other disease.

Treatment. (1) Feed thin slop adding 2 to 4 ounces of raw linseed oil. (2) If feces are clay-colored and slimy, dissolve 1 to 4 ounces of glauher salts in the slop once daily, according to size of hog and severity of symptoms.

Enforce daily exercise. Feed alfalfa hay, roots or a little silage daily to pregnant sows. Do not allow constant eating of cinders, coal, or grit of any kind. Screen ground oats and let bran form but a small part of the ration.

17. Depraved Appetite

Symptoms. *Hogs are thrifless and stunted; eat bones, earth, sand, manure, and all sorts of foreign objects.*

Cause. Indigestion (dyspepsia) from worms, over or underfeeding, incomplete rations, lack of exercise or some other disease.

Treatment. Remove causes. (1) Allow free access to wood charcoal and slaked lime. (2) Salt freely once a week. (3) Encourage exercise and allow green feed. (4) Feed digester tankage from a self-feeder. (5) Mix bonemeal or phosphate of lime in the feed as in rickets. (6) Give worm medicine, if worms are found in the feces.

Pig-eating, a disastrous form of depraved appetite, is a common vice of sows. It is induced by pampering, lack of exercise, overfeeding and resultant constipation. A sow thus ill-managed is in poor condition for farrowing; often has dead, puny or weak, sickly pigs, or is cross and nervous and suffers undue pain at and after farrowing; and, therefore, kills and eats her pigs.

A sow will be unlikely to practise this vice, if actively exercised every day throughout pregnancy and brought to farrowing time muscular, contented, accustomed to the presence of man and with bowels in an open condition.

Salt pork freely offered is the popular rem-

edy with farmers. Allowing the sow unlimited salt at the first sign of the vice sometimes ends the trouble and the following novel plan of making a pig-eating sow a kind "wet nurse" was suggested to the writer by a "Down East" farmer: "Remove the pigs one by one at birth and place them in a cotton-batting-lined basket back of the stove. When all are born let the sow drink a slop made of 4 quarts of shorts, 1 pint of New England rum and a bucketful of hot water. After she is blissfully asleep, return the pigs and help each to nurse; on waking she will take lovingly to her offspring."

18. Indigestion, Acute (Acute Gastritis)

Inflammation, or catarrh of the stomach; the intestines commonly are involved.

Symptoms. *Fever, loss of appetite, vomiting, diarrhea, pain. Hog separates from mates, lies down or stands with arched back and drooping tail.*

Cause. Irritants in the feed; soap, lye and soap powders in slop from kitchen, hotel or restaurant; fermenting or putrid slop from dirty barrels and troughs (poisons in such feed causing "swill barrel cholera"), caustic drugs given to destroy worms or prevent cholera.

Treatment. (1) Give 15 to 20 grains of ipecac in warm water to cause vomiting. (2) When vomiting stops give 1 to 3 ounces of castor oil in milk as a physic. (3) Withhold all feed for 24 hours and afterward feed light, laxative slop containing limewater. (4) Remove cause of irritation.

19. Indigestion, Chronic (Chronic Gastritis)

Symptoms. *At first those of acute indigestion; then irregular appetite, occasional vomiting, constipation or diarrhea, slow growth and permanent stunting.*

Cause. Worms, irritating feed or drugs, irregular feeding, overfeeding, weakness from improper or inadequate feeding.

Treatment. (1) If constipated, give a physic. (2) Follow with thin slop adding 2 tablespoonfuls of limewater per quart. (3) If not effective omit limewater and add 1 teaspoonful of granular hyposulphite of soda twice daily. (4) If diarrhea is present, give a small dose of physic, and follow with 20 to 60 grains of subnitrate of bismuth 2 or 3 times daily according to size of hog and severity of attack. (5) Allow active exercise, green feed and light laxative rations; remove causes; stop use of irritating drugs.

20. Scours (Diarrhea)

Symptoms. *Pigs a few days or weeks old droop, become sick, lose appetite and pass soft or liquid, greyish-colored, bad-smelling feces.*

Soon they become weak and thin, do not care to walk and if up, stand with arched backs. The disease causes many deaths among young pigs.

Cause. Pampering, overfeeding and confinement of pregnant sows; dirty, damp, dark, badly-ventilated pens and houses; sour or fermenting slop; any irritating feed; heavy feeding at and just after farrowing time; poisonous milk caused by sickness from farrowing; inflammation of the udder (garget); germs, which enter by way of the navel or mouth at birth.

Treatment. (1) Reduce sow's ration and twice daily mix 1 dram of powdered copperas in her slop. (2) Give little pigs a raw egg, 5 to 10 grains of subnitrate of bismuth and 5 grains of salol twice daily. (3) Increase the dose and add a few drops of laudanum, if necessary.

Prevention. Provide clean, dry, sunny, airy farrowing places; exercise pregnant sows and keep their bowels active by light, laxative rations. Feed the sow very lightly for 48 hours after farrowing, then gradually increase the ration. Disinfect the pigs' navels at birth and wash the sow's udder with a 2 per cent solution of coal tar disinfectant before allowing them to suck.

21. Severe Scours, (Dysentery)

Symptoms. *In hogs resemble those of simple scours in pigs (20, above). Liquid discharges from bowels, sometimes bloodstained, often foul smelling; thriftlessness, loss of flesh; staring coat; weakness.*

Cause. The irritated condition of the membrane lining the intestinal tract and the consequent watery secretion may be caused by worms; moldy, damaged, dirty, or putrid feed (which is poisonous); overfeeding; sudden change to green pasture; drugs.

Treatment. (1) Try to locate and remove cause. (2) Change feed. (3) Give light dose of castor oil in milk as a drench, or raw linseed oil in slop. (4) Give 3 times daily 1 teaspoonful of a mixture of 1 part salol, 2 parts subnitrate of bismuth and 2 parts prepared chalk; increase the dose, if necessary. (5) Add 30 to 60 drops of laudanum for an adult hog, if the symptoms are severe and pain is present. (6) After improvement results mix limewater freely in the slop.

22. Sore Mouth (Simple Stomatitis)

Symptoms. *Lining membrane of mouth inflamed. Loss of appetite; drooling of saliva; bad odor from mouth; champing of the jaws. Sores may form on inflamed membrane.*

Cause. Contaminated, caustic or hot feed; beards of grain or grass; injuries.

Treatment. (1) Allow soft, nutritious feed. (2) Wash mouth twice daily with soft water containing 1 tablespoonful of powdered borax

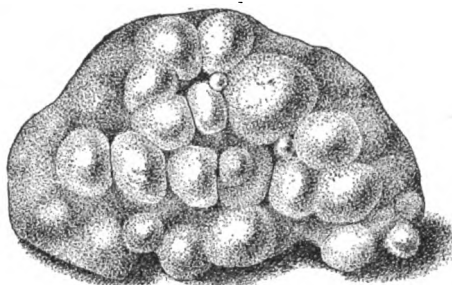


FIG. 397. The liver of a hog infested with bladder worms or *hydatids* of the tape worm that develop in the dog that eats such infested carcasses. (Bulletin 260, U. S. Dept. of Agr.)

or alum per pint. Adopt preventive measures, if cases are numerous.

23. Sore Mouth, Infectious or Canker (Necrotic Stomatitis)

Symptoms. *Young pigs stop nursing; are feverish and dull; show inflamed or ulcerous spots and patches upon the gums which are deep red in color. Deep ulcers (eating or canker sores) soon form and are filled with gray or yellowish dead (necrotic) tissue. Lips, gums, and snout may be affected. Smooth, painful lumps sometimes form on the snout and eventually form deep sloughing sores. Many pigs die; recovered pigs remain stunted.*

Cause. Invasion of scratches and wounds by the filth germ (*Bacillus necrophorus*) normally present in the intestines of hogs and prevalent in manure and filth of pens and yards where hogs are or have been kept. Sow's teats or feed soiled with manure convey the infection.

Treatment. (1) Isolate affected pigs. (2) Scrape ulcers clean, then paint with tincture of iodine or rub lightly with a lunar caustic pencil. (3) Afterward swab daily with a 2 per cent solution of permanganate of potash on absorbent cotton tied on a stick. (4) Paint lumps with tincture of iodine, then split deeply with a sharp knife and saturate with the tincture. (5) Burn pigs that die.

Prevention is most important. Provide clean, disinfected farrowing and living quarters. Abandon infected pens. Quarantine new-bought hogs until known to be healthy.

Do not cut off sharp teeth of little pigs; resultant wounds are readily infected. Black teeth are harmless and also need not be removed.

Diseases of Breathing System

24. Bronchitis

Inflammation of the lining membrane of the air passages of the lungs (bronchial tubes). Causes are same as those of cold (below).

Dust and lung worms produce worst irritation.

Symptoms. *Pigs are most susceptible and show fever, cough and all of the symptoms of cold but swallow readily. In acute bronchitis the symptoms are worse, breathing is difficult, the appetite is lost, and pneumonia (27, below) generally follows. Chronic bronchitis causes cough and failure to thrive.*

Treatment. Good nursing and feeding are the principal factors. Treat as for cold, steaming the head 2 or 3 times daily. Glycoheroin in 1 to 4 teaspoonful doses given every 4 to 6 hours is helpful. *Prevention* is most important.

25. Cold (Nasal Catarrh)

Inflammation of the lining membrane of the air passages of the head.

Symptoms. *Sneezing followed by a watery discharge from the nostrils, which gradually becomes thick and cream-colored; the hog is listless, feverish and lacks appetite. In chronic cases the nostrils become clogged, breathing is difficult and loud and the snout becomes thickened. Malignant catarrh is a still more severe form.*

Cause. Exposure to damp, wet, and cold or to irritating gases from filth in overcrowded, badly-ventilated houses; dust, straw stack and manure beds; overheating and chilling.

Treatment. (1) Move hogs to clean, dry, airy, snug quarters. (2) Feed light, laxative, nutritious slop, containing a little raw linseed oil or epsom salts. (3) Sprinkle a little chloride of lime about the pen. (4) In severe cases steam the head with hot water containing 1 ounce of oil of eucalyptus to the gallon. (5) If the nostrils become clogged, inject a little sweet oil. Take steps to prevent future cases by removing causes.

Treatment of malignant catarrh seldom pays. Kill and burn affected hogs and cleanse and disinfect houses and pens.

26. Pleurisy

Inflammation of the membrane (pleura) lining the chest cavity and covering the lungs.

Symptoms. *Those of cold, bronchitis and pneumonia, but hog also is stiff, sometimes lame, very sore in the chest, shows flank heaving, breathes jerkily and has a suppressed, distressing cough. The chest cavity fills with fluid in severe cases and death occurs; or the disease may become chronic.*

Caused by sudden chill or wetting when warm; exposure; and the same causes as those of cold, sore throat and bronchitis.

Treatment. Practically the same as for pneumonia (below). The veterinarian, if sure pleurisy is present, may draw off the liquid from the chest cavity by introducing a trocar and canula.

27. Pneumonia

Inflammation of the tissues of the lungs.

Symptoms. *High fever, labored breathing, deep, hollow cough, weak or imperceptible pulse, red or dark-colored membranes in nose, etc., rusty discharge from the nostrils, great distress. Death results quickly in acute attacks. After death the lung tissue looks like liver or may have a mottled, dark red and gray appearance; pus pockets may also be found.*

Cause. Fat hogs are most subject. Attacks follow cold, sore throat, bronchitis, pleurisy or a combination of these, or are caused by infection or a complication of grave diseases, such as cholera. Overheating and driving also induce congestion of the lungs and pneumonia as do dust and lung worms (p. 336).

Treatment. (1) Isolate the animal in a warm, clean pen. (2) Blister the chest with oil of turpentine 10 parts; croton oil 1 part (Craig). (3) Give Fever Mixture II. (p. 372), or, glycoheroin in teaspoonful doses every 3, 4 or 6 hours; increase doses if necessary. (4) Relax the bowels with raw linseed oil in slop. (5) Give stimulants during recovery.

28. Snuffles, Bullnose, Snout Disease

A disease affecting the mucous membranes of the passages and sinuses (cavities) of the head; occurring in a simple and also a malignant form.

Symptoms. *In the simple catarrhal form a thick, unhealthy discharge comes from the nostrils; the pig sneezes, snuffles and wheezes, but there is no distortion of the bones of the snout. In the malignant, necrotic form, constituting true snuffles, bullnose or snout disease the snout and bones of the face become enlarged and bulging and rickets (p. 331) is a common complication. Sniffing and blowing of the nose are constant and aggravated. Affected pigs fail to thrive, never recover completely and may quickly succumb.*

Cause. The simple disease is induced by dust, irritating gases in dirty pens, cold and wet. The severe or malignant form may start with simple inflammation. Then the mucous membranes are invaded by the filth germ and the bones become spongy and distorted. Tendency to the disease is hereditary, but filthy conditions cause it or make it worse.

Treatment. The mild form disappears when dust is done away with, sanitary conditions maintained and nutritious feed supplied. Sprinkle chloride of lime in the pens. *Prevent* by cleanliness, disinfection, and measures for avoidance of rickets. The malignant disease is incurable; affected pigs should be killed and burned.

29. Sore Throat

Symptoms. *Fever, pain, cough, difficulty in swallowing and breathing, swelling of the*

throat, loss of appetite. In severe cases (quinsy) and those caused by infection, cholera or other disease, the membrane becomes ulcerated or even gangrenous and death results.

Cause. May develop from cold or result from any cause of same; filthy quarters and feed are contributing causes. Germ infection causes the most acute attacks.

Treatment. (1) Isolate affected hog. (2) Rub throat daily with white liniment (p. 372) or turpentine and lard. (3) Noose the upper jaw and spray or swab the throat with a 2 per cent solution of peroxide of hydrogen or permanganate of potash once or twice daily. (4) Give electuary (p. 372) in 1 to 2 teaspoonful doses. (5) In severe cases swab with a 1 per cent solution of nitrate of silver. (6) If cough and swelling persist, blister (p. 371) the throat.

Parasites and Skin Diseases

30. Lice

Large blood-sucking parasites, extremely common and quite injurious. Infest mostly thriftless pigs, being found with their nits or eggs principally in the folds of skin just behind the ears. Lice are picked up from lousy hogs and places where they have been. Affected pigs rub and scratch so that the skin becomes scurfy and scabby, and fail to thrive.

Treatment. (1) Dip in a 2 per cent solution of coal tar dip and repeat 2 or 3 times, or as often as necessary, at 2 week intervals. (2) Or spray with a mixture of 8 parts water and 1 part kerosene emulsion made by dissolving 1 pound of hard soap in 4 gallons of boiling water, adding 2 gallons of kerosene to the boiling solution and stirring and shaking, or pumping back and forth, until an emulsion is formed. (3) Or use (especially in winter) a mixture of 1 part kerosene and 2 to 4 parts machine oil or cottonseed oil, pouring it from an oil can behind the ears and along the back bone, or keeping it in a patent "hog oiler." (4) Pour crude petroleum oil into hog wallows and bathing tanks or pools. Do not apply kero-



FIG. 398. A pig with mange. Note the rough condition of the coat. (Va. Bulletin 189)

sene or any strong spray, wash or dip to a pregnant sow as abortion may result.

31. Nettle Rash (Urticaria)

A non-contagious but acute disease of the skin caused by sudden changes of feed, especially green rape and legumes; indigestion, irritation from too strong dip solutions; wet and filthy beds and pens; infectious diseases.

Symptoms. Sudden occurrence of raised red swellings or spots upon the skin of the ears, neck and inner surfaces of the fore and hind legs. Spots tend to run together and form blotches. Itching is intense, causing rubbing and rawness.

Treatment. (1) Physic with epsom salts (2 to 4 ounces) in slop or as a drench. (2) Follow with teaspoonful doses of granular hyposulphite of soda twice daily in light, laxative slop. (3) Bathe itching parts with soft water containing 1 tablespoonful of granular hyposulphite of soda per quart. Avoid causes.



FIG. 399. Piece of the intestine of a hog infested with the Thorn-headed Worm. (Ohio Bulletin 280)

32. Pitch Mange, "Diamond Skin Disease" (Eczema and Erythema)

Symptoms. Red, swollen, painful, inflamed condition of the skin of back, ears, and under side of body in white hogs; red spots, blisters and pustules become raw and wet from irritation by rubbing, or become crusty, scabby and slough off. The skin may gradually become thick, hard, and show cracks which bleed.

Cause. Wet and filth; sun-scalding (erythema) when pasturing rank, wet growth of rape, clover or other green forage; filthy hog wallows; cholera, or other germ diseases; careless, unsanitary conditions or practices in general.

Treatment. (1) Dip in a 1 per cent solution of coal tar dip and repeat as often as necessary. (2) In sun-scald, bathe with soft water containing 4 ounces Goulard's extract and 1 ounce glycerine per pint. (3) Remove cause; give sloppy feed; keep bowels active.

Parasitic mange, caused by a mite, produces a scabby condition of the skin and intense itching near the ears, around the eyes, and on the inner surfaces of the legs. Treatment consists of dipping, sulphur being added to the dip solution.

33. Worms

Round Worms. Pinkish-white, the adult female measuring 6 to 12 inches. Found loose in small intestines; picked up by pigs in infested feed and water. Very common. Badly infested pigs become poor and "pot-bellied." Strong, well fed ones resist or throw off the worms.

Thorn-headed Worms. Milk-white, tapering; female from 2 to 11 inches long. Carries a row of hooks on head and attaches by means of these to the inside wall of the intestines. Picked up in white grubs (the larvae of May beetles) in orchards and sod land, one form of the worm living in these grubs. Less common than the round worm. Causes poor condition and often spoils intestines for use as casings.

Kidney or "Lard" Worm. Mottled, blunt at both ends; as thick as a knitting needle; female $\frac{1}{2}$ to $1\frac{1}{2}$ inch long. Found in kidney fat and sometimes kidneys themselves; picked up in food and water. Causes little if any noticeable injury and does not cause paralysis.

Pin Worm. White or brownish, pointed at both ends; female $\frac{1}{2}$ to 1 inch long. Found in the large intestine; picked up in food and water. Common but causes little or no injury or distress.

Whip Worm. Tail end slim; female $1\frac{1}{2}$ inch long. Found in large intestine; picked up in food and water. Common but practically harmless.

Lung Worm. White, thread-like; 1 to $1\frac{1}{2}$ inch long. Found in air passages in lungs; picked up in old, low, wet pastures and other infested fields. Very harmful, causing cough, poor, "pot-bellied" condition, and sometimes fatal lung troubles. Ward off by feeding well

and keeping hogs healthy and away from infested land.

Trichina. Hair-like; female, $1/12$ inch long. Adult worms found in intestines; young in muscle tissue. Hogs become infested by eating infested rats. Adult worms cause digestive troubles; young in muscles cause rheumatic symptoms. Deadly to man if worms are eaten in undercooked pork. To prevent trouble, destroy rats about farm; do not feed slaughter house refuse to hogs; cook pork thoroughly.

Treatment. Intestinal worms are generally treated according to the numbered directions given below. Other forms call for special measures as already suggested. In all cases, prevention is the most important factor; avoid the sources and causes; so far as possible maintain cleanly conditions in respect to houses, pens, beds, feeding troughs, and the drinking and bathing water.

Worm medicines are: (1) Dissolve powdered copperas (sulphate of iron) in hot water and mix in slop for hogs on 5 consecutive mornings, allowing 1 dram of the powder for every 100 pounds, live weight, of pigs; repeat in 2 weeks, if necessary. (2) Turpentine also is useful, the dose being 1 teaspoonful per 80 pounds live weight given in slop the first thing in the morning for 3 successive days. Do not give pregnant sows copperas or turpentine. Sulphur, 2 to 4 teaspoonfuls in the feed is the safest drug for them. (3) When not too expensive 5 grains of calomel and 8 grains of santonin per 100 pounds of body weight may be given once in slop to pigs penned in lots of 5 or 6. Areca nut, oil of chenopodium, Venetian red, wood ashes, and commercial worm powders also are popular remedies. (See also p. 132.)

CHAPTER 30

Common Diseases of Poultry

By DR. B. A. BEACH of the Veterinary Department of the University of Wisconsin, whose experience with poultry includes practical work with flocks under farm conditions as well as the laboratory study of chicken diseases and how to cure them. The diseases described are those which experience has shown to be most commonly met with in practice. The author has had personal experience with most of them, but wishes also to give credit to the standard works on diseases of poultry by Drs. Salmon and Pearl, Surface and Curtice.—EDITOR.

The Fowl's Body and Its Work

(By the Editor. See p. 345 for illustration)

FOWLS, like the animals described in previous chapters, are made up of 7 systems or groups of organs, but in common with other birds they show several important differences.

Skeleton. The bones of what in animals are forelegs are modified into wing structures; the head, feet and legs have distinctive form and structure; and certain bones contain, instead of marrow, air cavities connected with the breathing system. These cavities aid the bird in flying and keeping its balance when in the air, and also increase the power of its voice. Such hollow bones are the sections (*vertebrae*) of the backbone, the breastbone, ribs, thighs, shoulder blade, pelvis and arm bones.

The muscular system of fowls and turkeys is peculiar in that some muscles are dark colored, while the powerful wing-moving muscles forming the breast are light. In ducks, geese, and pigeons, all the "meat" is dark.

Digestive system. Fowls have no teeth; any biting is done by the beak, while the grinding or chewing of food is done by internal organs described below. The gullet leads first to a storage pouch or "crop," in which no special digestive change takes place. Then it leads through an enlarged section—the first stomach (*ventriculum*)—to the gizzard. This is a sac with thick, muscular walls containing pebbles and grit, in which food, already somewhat softened, is crushed and ground. (Flesh eating birds such as the vulture and buzzard have no crop and only a thin walled gizzard). Food passes from the gizzard directly into the intestines which, unlike those in animals, are of about the same diameter throughout. Here the secretions from the liver, pancreas, etc., act on the food, after

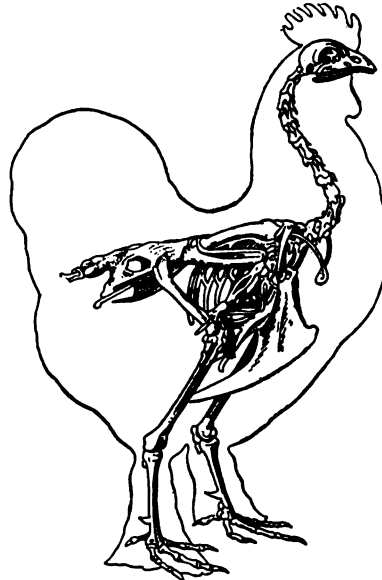


FIG. 400. The skeleton of a rooster showing the typical bony framework of the bird tribe

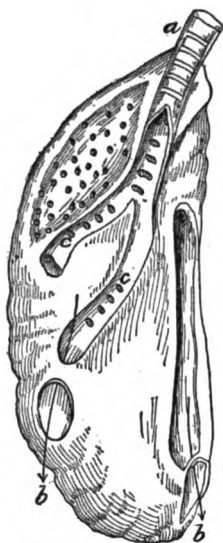


FIG. 401. The right lung of a goose. *a*, bronchus or branch of wind pipe; *b*, openings into abdominal and chest air sacs; *c*, branches of the bronchus. (Me. Special Bulletin)

in front of the kidneys. In caponizing they are easily removed through slits made between the last two ribs. The ovaries occupy the same relative position in the hen.

The egg cells develop in the ovaries and, when ripe drop as yolks into the mouth of the *oviduct* where, if the hen has mated, they are fertilized by sperm cells from the male. As they pass down this canal to the cloaca, they receive first the layers of white (*albumen*), next the two shell membranes, and finally the shell and its bloom or moist, protective covering. This passage and development take normally about 30 hours. In a laying hen, eggs are often found at different stages of development all the way from tiny, unripe yolks in the ovary to nearly completed eggs in the oviduct. One mating with a male is enough to fertilize a number of eggs, ordinarily those that are to be laid for 10 days. Therefore, when infertile eggs are desired, it is necessary to separate cockerels and pullets before they come of mating age, and to keep them apart thereafter. On the other hand,

which the nutritious parts are absorbed through the intestinal walls. The rectum does not open outwardly but into a sort of cavity or vestibule (*cloaca*) in which the urine, reproductive fluid, feces and eggs are held before being discharged.

The blood circulation differs but slightly from that in animals, but the body (blood) temperature is much higher, or from 105 to 111 degrees F.

Breathing system. The lungs are small and connect through the bronchial tubes with large air sacs placed between the backbone and the internal organs. Also as part of this system there are smaller sacs (located between various muscles) which open into the bone cavities mentioned above. When the breathing muscles contract, the air is forced out of the sacs and through the lungs; as they relax, fresh air rushes in.

Urinary and reproductive systems. Of all species of birds only the ostrich has a bladder. In the others, urine passes directly into the cloaca to be mixed and expelled with the feces. The testes of the male lie against the roof of the abdominal cavity just

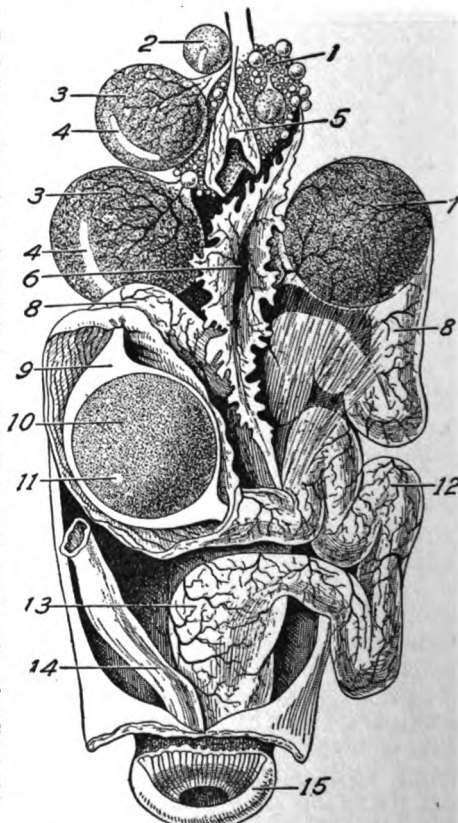


FIG. 402. The reproductive system of a hen. 1, ovary; 2, egg cell (ovule); 3, older ovules showing line where its sac or follicle will break (4); 5, empty follicle, from which ovule has passed into funnel (6) of the oviduct; 7, ovule (now a yolk) in oviduct (8), 9, first layer of white on an older yolk (10); 11, germinal disk where yolk is fertilized; 12 isthmus of oviduct; 13, uterus where shell is added; 14, rectum; 15, cloaca. (New York [Cornell] Bulletin 353)

eggs for hatching purposes must be obtained from hens that have been mated to a vigorous male, preferably not less than 1 nor more than 10 days before the eggs are laid.

The Recognition and Treatment of Diseases

The discovery and treatment of poultry diseases is often a difficult matter for several reasons: (1) Being small and active, fowls are not easily observed from day to day, as are cows and horses. A slight change in their condition is, therefore, easily overlooked. (2) Being only one of a large number it is especially easy for a single sick bird to escape notice until it has infected others. (3) It is fully as hard to stamp out a disease once it has become established in a flock, as it is to keep it out in the first place. (4) The feather covering hides many slight but important changes in condition that mean much to the experienced poultryman. For these reasons prevention is a very important factor in successful poultry raising, and constant cleanliness, sanitation and careful attention to details of feeding, etc., are the means whereby it can be assured. Whenever disease appears, especially if it is of an unfamiliar type and if the birds are valuable, it is wise to put the sick ones by themselves where they can be watched and treated without endangering others. At the same time the entire premises should be well disinfected according to the following program:

How to disinfect. (1) Clean up. Burn all droppings and litter. (2) Thoroughly scrape the floors, walls, and ceiling, including all corners. (3) Remove and disinfect hoppers, drinking fountains, nests, and roosts. (4) Saturate everything with a solution of commercial coal tar disinfectant prepared according to directions printed upon the label of the original package. Have the mixture reach all corners, cracks and crevices. (5) Burn all loose trash, boards, etc., littering the yards. (6) Board up all spaces under hog pens, corn cribs or other out-buildings into which hens might stray. (7) Fill all sink holes and wallows with fresh earth. (8) When possible plow and seed down all places where chickens have been allowed to run.

Use the index of symptoms below in the same manner as directed on page 267 in connection with diseases of horses. And in studying a sick fowl, keep always in mind the appearance and actions of a healthy one. The usefulness of the table will naturally increase as you gain experience and ability in recognizing the various conditions and actions that accompany disease.



FIG. 404. Whitewashing an easy way to keep hen-houses clean and sanitary

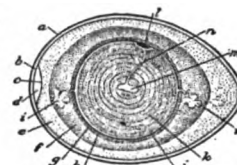


FIG. 403. Structure of an egg: *a* shell; *b* outer shell membrane; *c* inner shell membrane; *d* air cell; *e* outer thin portion of albumen; *f* middle jelly-like portion of albumen; *g* inner dense portion of albumen; *h* yolk membrane; *i* chalaza; *j* thin film of white yolk; *k* layers of yellow yolk separated by thin layers of white yolk; *l* germinal disk; *m* central part of yolk filled with white yolk; *n* tube connecting *l* with *m*. (N. Y. [Cornell] Bulletin 353)

Index of Symptoms

Abdomen	Fluid in—7 greatly distended—1 impaired—11	Blood-streaks	on internal organs—(of dead bird) 28
Appetite	Loss of—1, 5, 8, 14, 17, 22, 26, 32, 40, 42, 43	Breathing	Difficulty in—7, 24, 25, 31 Fetid breath—24 labored—5, 17, 22, 31

	rapid—12	Inflammation	of internal organs (of dead bird)—28
	Rattling sound—22	Isolate	of mouth and throat—24
	through mouth—30	Kidneys	themselves, Chicks—23
Chicks	dumpy—22	Lameness	(of dead bird) inflamed—28
	go by themselves—23	Leave Nest	39
	lie down—14	Legs	Setting hens—37
Comb	pale—33, 40, 43		peculiarly bent—14
	black—17		Scales or crusts develop on—39
	brownish yellow—10	Lie Down	Chicks tend to—14
	Scabs on—26	Liver	(of dead bird) enlarged with gray patches—29
Condition	depressed—3, 18, 20, 23, 26, 27, 29, 31, 32		(of dead bird) soft, light colored, blood clotted—16
	droopy—33		(of dead bird) shows white patches—28
	drowsy—28	Mouth	False membranes in—32
	dull—13-41		Inflammation of—24
	dumpy—(in chicks)—22	Nostrils	Patches of pus in—26, 32
	Fail to thrive—37		Discharge from—25, 26, 31, 32
	generally disturbed—30	Pain	Discharge thin and watery—26, 27
	inactive—10		Forcible extension of legs causes—19
Constipation	13	Paralysis	17
Coughs	40-42	Picks	constantly at feathers—37, 38
Crop	becomes paralyzed—28	Scales	Pox, on comb and head—26, 32
	Distention of—5-28		on legs—39
Diarrhea	8, 13, 17, 22, 23, 31, 41, 43	Sits	most of time—19
Discharge	from vent, foul smelling—34	Skin	around vent, reddened, sometimes ulcerated—34
Droppings	loose, white—22, 23		Yellowish tinge to—11
Eating	Difficulty in—24	Sneezes	42
Eyes	badly swollen—26, 32	Spittle	frequently—25, 40
	closed—26, 32	Staggers	Excessive secretion of—17
	filled with tears—26, 32	Swelling	9
	Inflammation of—26, 32	Thirst	around joints—11
	Pockets below eyes distended 26, 32	Throat	intense—13, 28
Exhaustion	following efforts to lay egg—3, 6		Inflammation of—24
Falls	and beats ground with wings—9	Toes	Patches of pus in—24
	head stretched forward—12		frosted and enlarged—7
	insensible and dies—2	Tongue	Swelling of—11
Feathers	become brittle, drop off—27	Ulcers	Scab or crust on—30
	become rough—23, 28		becoming running sores—11
	Constant picking of—37, 38	Unthriftiness	38, 39
	fall from all parts of body—23	Vent	Feathers around, soiled—34
	fall off in patches—35		Lining membrane of, red and swollen—34
	ruffled—8, 17, 31, 33, 40, 43		Mass of reddish tissue protrudes from—18
Gapes	42		Offensive smelling discharge from—34
Head	Loss of control of head and neck—15		
	Membranes of, pale—29		
	Pus scales on comb and—26		
	Small grayish-white spots on—27		
	thrown backward, forward, or twisted—15		

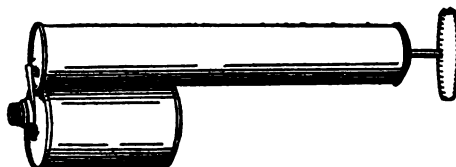


FIG. 405. The simplest form of spray pump for disinfecting henhouses

Walks	in circle—9 unsteadily—14 with difficulty—11, 19
Wattles	brownish yellow—10 pale—33, 40, 43
Weight	Loss of—11, 24, 33, 36, 38, 40, 41
Wings	droop—23, 28, 31, 35
Worms	in wind pipe, white or red—42

Non-infectious Diseases

1. Abdominal Dropsy

An accumulation of fluid or egg yolks in the abdominal cavity.

Cause. In adult fowls poor circulation from overfeeding and lack of exercise cause an accumulation of fluid; in chicks it is a sign of malnutrition. For some unknown reason egg yolks sometimes miss the oviduct and accumulate in the abdominal cavity. **Symptoms.** Loss of appetite. Enormously distended abdomen. **Treatment.** None can be recommended. The condition may be temporarily relieved by removing the fluid, which usually returns.

2. Apoplexy or Hemorrhage

Rupture of a blood vessel caused by over exertion or an unhealthy condition of the blood vessel walls, and the formation of a blood clot on the brain, may affect any bird, but over-fat ones are most susceptible. Improper feeding is sometimes at the bottom of the trouble. **Symptoms.** The bird falls and dies. **Treatment.** If many cases occur, modify conditions by encouraging the flock to exercise and giving less concentrated feed and more green stuff.

3. Broken Egg in the Oviduct

This may occur either before or after the hard shell has been deposited. **Symptoms.** Evidence of injury by which the egg was broken may or may not be present. A depressed condition and exhaustion are due to the efforts to expel the egg. **Treatment.** Little assistance can be given. The hen may recover, if the oviduct does not become too greatly inflamed.

4. Bumble Foot

An enlargement on the bottom of the foot, usually an abscess, following a wound caused by stepping upon a sharp object or jumping from a high roost to the ground. **Symptoms.** Lameness, sometimes so severe that the affected leg becomes practically useless. **Treatment.** That of ordinary birds is not profitable. If the enlargement is hard, indicating that pus is not present, treatment is not required.

(1) Isolate valuable birds. (2) With a sharp knife open the abscess, then squeeze out pus. (3) Inject tincture of iodine. (4) If bleeding is profuse, tie a string tightly around the leg above the foot, and leave it on for a few hours. (5) Bandage the leg for 3 or 4 days, but each day syringe the wound with tincture of iodine.

5. Crop Bound

Impaction of the crop with food; a not uncommon condition. **Symptoms.** Distention of the crop, loss of appetite, labored breathing. **Cause.** Partial paralysis of the crop, indicating low vitality, is perhaps the most frequent cause. Others are string, feathers, etc., lodged in the passage leading from the crop; depraved appetite; and over-loading of the crop with indigestible matter. If many birds in a flock are crop-bound, faulty management is the cause.

Treatment. (1) Give a tablespoonful of castor oil. (2) Hold the bird's head downward and gently knead the crop to force food through. (3) If this fails, open the crop as follows: *a.* Hold the bird back downward on a table. *b.* Pluck feathers from front of crop. *c.* Paint skin with tincture of iodine. *d.* With a sharp knife sterilized by boiling cut an opening 1 inch long through skin and wall of crop. *e.* Remove contents through the opening. *f.* Insert finger to make sure that outlet is not obstructed. *g.* Wash out crop with lukewarm water. *h.* Stitch crop with clean white thread (preferably silk) then stitch opening in skin. *i.* Dust with boric acid powder. *j.* Give soft feed sparingly for 3 or 4 days.

6. Egg Bound

Inability of the hen to expel the egg from the oviduct, caused by such conditions as: egg of too large size; twisting of the oviduct, and resulting closing of the passage; diseased condition of the walls of the oviduct; stricture of the oviduct. **Symptoms.** During the early stages marked efforts by the hen to expel the egg, followed by exhaustion. **Treatment.** Cases caused by conditions other than a large egg usually are incurable. (1) Apply vaseline about the vent. (2) Gently run the fingers into the oviduct as far as possible and if the egg can be felt, try to remove it by gentle manipulation. If this fails, (3) rupture the egg and remove the pieces of shell with tweezers.

7. Enlargement of the Heart

Caused by leaky heart valves and other conditions which derange the circulation, this is frequently met with in male birds and sometimes in hens.

Symptoms. Difficulty in breathing is sometimes noticeable. Because of poor circula-

tion the toes often are frosted causing a permanent enlargement. The abdominal cavity frequently contains quantities of fluid. Death in these cases usually is sudden.

Treatment is useless. In selecting male birds for the breeding pen choose only those in perfect health; those having enlarged hearts seldom survive the activity and excitement of the breeding season.

8. Enteritis

Inflammation of the intestinal tract, caused by the eating of decayed vegetable or animal matter, or other poisons, and by close confinement on foul ground. It also is a symptom in other diseases. Symptoms. Loss of appetite, ruffled feathers, diarrhea, frequently death. Treatment. (1) Remove cause. (2) Administer purge in form of one tablespoonful of epsom salts dissolved in warm water.

Of all domestic animals chickens are the most susceptible to poisons, especially decaying animal and vegetable matter. This condition is often mistaken for fowl cholera (p. 347).

9. Epilepsy—Fits

The bird which appears normal between attacks may walk with a staggering gait, go round in a circle, fall over and beat the air with its wings, etc. Treat for worms in the intestinal tract (p. 350) which constitute the most common cause.

10. Frosted Comb and Wattles

This condition is at times serious in male birds especially of the single comb breeds due to the absorption of poisons from the dead tissue. It is frequently seen in show birds returned from a warm show room.

Symptoms. The frozen part of the comb or wattle turns brownish-yellow in color and the bird becomes inactive. In severe cases death results.

Treatment. (1) Gently massage the comb or wattle with vaseline or sweet oil until the frozen part becomes pliable. (2) Rub gently with camphorated oil once daily until the frosted area begins to dry down showing that healing is taking place. Take care in transferring birds in severe weather.

11. Gout

There are two forms, both associated with a diseased condition of the kidneys whereby uric acid is retained in the blood.

1. Articular Gout is an affection of the joints. Symptoms. Swelling around the joints, especially of the toes. The bird walks with difficulty. Ulcers often occur and form running sores. Loss of weight and impaired appetite are noted in advanced stages.

2. Visceral gout is attended by a general disturbance. Symptoms. Loss of weight and a yellowish tinge of the skin. The appetite may or may not be impaired.

Treatment for both. Give each bird 1 tablespoon castor oil. Supplement the diet with green feed. Induce exercise.

12. Heat Prostration

Heat prostration occurs most frequently in heavy birds, which usually drop insensible, with head stretched forward, and breathe rapidly. Death usually results, though mild cases may recover. Treatment. Remove to a cool place, and apply cold water to the head. To prevent, provide flock with a shady place in hot weather, with access to cold water.

13. Indigestion

Any disorder of the digestive tract associated with improper feeding is indigestion. Feeding at irregular intervals, allowing the birds to overeat when very hungry, and the feeding of a ration composed entirely of dry grains in the absence of sufficient exercise are common causes. Meat scraps frequently cause it if given suddenly and freely to very hungry birds.

Symptoms. Tendency to sit on the roosts and indifference at feeding time; this dullness may persist more or less for a long time, if the cause is not removed. Diarrhea or constipation may be present or they may alternate. The normal droppings of chickens are dry enough to retain their shape. If in considerable numbers they are very soft, they indicate that diarrhea is present and constitute a warning, which if heeded, may prevent serious trouble. At times an abnormal thirst may be noted. There is suppression of the egg yield, if the condition is general in the flock. Death may result.

Treatment. Correct the method of feeding and supplement the ration with green feed, where possible. Mix 1 tablespoonful of epsom salts in each 2 quarts of drinking water.

14. Leg Weakness

A condition occurring in growing chicks from a few days to 6 months of age, most commonly caused by overfeeding in the absence of sufficient exercise. The feeding of a restricted ration may cause it and improper brooder conditions, as regards heat, are said to.

Symptoms. Unsteady gait; inability of chick to stand upright, giving the legs a peculiar bent appearance; a tendency for chick to assume a leaning or lying down position. At first the general condition is undisturbed; eventually the appetite is lost and death results.

Treatment. There is none for affected

birds. To prevent the disease in others: (1) Remove the cause. (2) Feed brooder chicks sparingly the first 10 days of their lives. (3) Give chicks a month or more old plenty of green feed.

15. Limberneck

The partial or complete loss of control of the muscles of the neck, often accompanying other conditions such as the presence of intestinal parasites, poisoning and indigestion. Symptoms. The loss of control of the head and neck which may be thrown backward, forward or twisted to one side. Treatment. Locate and remove cause, if possible; give a tablespoonful of castor oil.

Wry neck is similar to limberneck and the practical poultryman need not try to distinguish them apart. Strictly speaking limberneck is that condition in which the head is drawn backward. Both are nervous troubles, secondary to other conditions.

16. Liver Disease

Symptoms. Usually nothing abnormal is noted until death. If a dead bird is opened the liver is found to be soft, light in color and sometimes covered with blood clots. Cause. Too concentrated diet and lack of exercise seem to induce the disease. Hens in confinement sometimes die in considerable numbers; but a degenerate liver is seldom seen in hens having free range. Treatment. Supplement the diet with sprouted oats or other green feed. Scatter feed in deep litter to induce exercise. Occasionally a hen will die even under the best conditions, if confined.

17. Poisoning

Mineral poisons. Common salt, lye, nitrate of soda and lead are probably the most common. Poultry obtain them in various ways, such as the feeding of salt meat, or from paint cans carelessly left within their reach. Symptoms. These vary somewhat with the drug taken, but in general are as follows: Loss of appetite, ruffled feathers, paralysis, diarrhea, labored breathing, excessive salivation (secretion of spittle); sometimes the comb turns black. Treatment. Locate and remove the cause. Give one teaspoonful of castor oil.

Vegetable poisons. Chickens are very susceptible to poisoning from eating decayed meats, moldy grains and spoiled canned beans and peas; putrid water in sink holes in barnyards, etc., is at times poisonous. Symptoms. The birds sometimes die before any symptoms are noticed. Usually the effects are similar to those caused by mineral poisons. If moldy grains are the cause, the onset may be very slow, a bird dying now and then. In such cases the hens in laying condition die

first, as they eat more grain. In an instance observed by the writer the hens died very rapidly and in large numbers. Death was so sudden that several hens were found to contain hard shelled eggs ready to be laid. The cause of the trouble was decayed garbage. Treatment. Same as for mineral poisoning.

18. Prolapse of the Oviduct

Symptoms. Protrusion of a part of the oviduct from the vent as a mass of reddish tissue; consequent depression. Cause. Undue straining in trying to expel a very large egg or other obstruction; diseased condition of the oviduct or chronic constipation. Treatment. If the protruding mass is purplish in color from long exposure and especially if it has been picked at by the other hens, kill and destroy the bird. If only a small part protrudes and is light in color wash in warm water, gently replace within the vent and keep bird in a quiet place for a few days. Success depends largely on early recognition of the condition.

19. Rheumatism

Inflammation of muscles and joints, especially those of the legs, caused by undue exposure to cold and dampness. Prevalence of the disease indicates probable dampness of the house. Symptoms. The bird sits most of the time or walks with difficulty. Forcible extension of the legs causes pain. The symptoms of a disease of the kidneys, called articular gout, are similar to those of rheumatism. Treatment. (1) Kill and burn affected common birds. (2) Improve housing conditions. (3) Dissolve $\frac{1}{2}$ teaspoonful of potassium iodide in each gallon of drinking water. (4) Give $\frac{1}{2}$ tablespoonful of castor oil, if thought advisable to treat individual birds. (5) If possible, remove affected birds to a warm room.

20. Tumors

New tissue growths frequently occurring in chickens and especially affecting the ovaries. Symptoms. Depression usually extending over a long period of time and terminating in death. Treatment of internal tumors is impossible. Those occurring on the surface of the body may sometimes be removed. Usually it is better to destroy the bird.

21. Wounds and Abscesses

Cuts and tears are of frequent occurrence in chickens. Attention is often necessary by the poultryman in order that the usefulness of wounded birds may not be impaired. (1) Carefully pull the feathers from around the edges of wound. (2) Wash with saturated boric acid solution. (3) In long cuts or tears stitching is advisable, in which case use a good

sized needle and thread sterilized by boiling. (4) Make the stitches about one half inch apart. (5) Leave a small opening at lowest point for drainage. (6) Apply boric acid powder. (7) Remove stitches in 10 days, or when union has taken place.

Abscesses may be distinguished from tumors by the fact that they are soft and fluctuating. (1) Remove feathers from a small area at lowest point. (2) Cleanse with saturated boric acid solution. (3) With sharp knife make an incision about one inch in length. (4) Empty the abscess of all pus. (5) Syringe out daily with above solution until discharge stops.

Infectious and Contagious Diseases

22. Aspergillosis

In adult fowls is usually an affection of the air passages, lungs and sometimes other organs of the body. **Symptoms.** Loss of appetite, labored breathing and sometimes a rattling sound. Death may occur before any symptoms are noted. **Cause.** A fungus or mold which usually comes from musty grain or litter. **Treatment.** (1) Kill and burn affected birds. (2) Remove the cause. (3) See that the house is dry and well ventilated and the litter of good quality. (4) Feed no musty grain.

In chicks usually manifests itself as pneumonia (Brooder pneumonia) among brooder chicks. **Symptoms.** Dumpy condition, rapid breathing, diarrhea, white in color. **Treatment.** (1) Do not treat affected chicks; destroy them. (2) Cleanse and disinfect the brooder, and remove to new ground. (3) Keep brooder at right temperature. (4) Feed carefully.

23. Bacillary White Diarrhea

This disease of chicks is widespread in the United States, but most common and deadly in the Eastern states. In some sections it destroys thousands of chicks annually. It is caused by a germ (*Bacterium pullorum*) which is frequently carried by adult hens in infected districts. Their eggs become infected through the ovaries and chicks hatched from such eggs are not only infected themselves, but in turn infect others. Hens which have passed through outbreaks and recovered are likely to be carriers.

Symptoms. It occurs during the first few days of life. Affected chicks appear depressed, isolate themselves from the rest or remain under the hover; their feathers become rough and their wings droop. A



FIG. 406. Healthy chicks. Compare with 408. (Both from Me. Special Bulletin)

whitish diarrhea soon makes its appearance and the down around the vent becomes soiled ("pasting up behind"). It should be understood that this is a blood poisoning (*septicæmic*) disease and that chicks suffering from other conditions may show similar symptoms, including the white diarrhea. The mortality is usually high. A "white diarrhea" (aspergillosis, above) caused by improper brooding conditions sometimes is confused with this disease.

Treatment. No treatment of infected chicks is advised; destroy them all. Clean up and disinfect.

Feed sour milk to prevent the spread of infection. Entirely to eliminate the disease the entire flock should be killed; or tested by the "agglutination test" at an agricultural experiment station.



FIG. 407. Head of a fowl showing canker patches on mouth and tongue. (Me. Special Bulletin).

24. Canker and Diphtheria

Pus patches (caused by pus germs) in the mouth and throat are termed *canker* and are often seen in roup (p. 348). Mild canker due to injury of the mouth and throat is common. False membranes, also seen in roup, and other results of inflammation in the mouth and throat are called *diphtheria*. The term *thrush* is applied to cases caused by a fungus or mold. Most poultrymen, however, use the terms canker and thrush interchangeably. **Symptoms.** Fetid breath, difficulty in eating and breathing, loss of weight. In throat cases the bird may be suffocated before any symptoms are noticed. **Treatment.** (1) Scrape off pus patches or as much as will come away readily but avoid wounding the membrane. (2) Paint surface with pure lysol, taking care to avoid the unaffected portions of the mouth and throat.

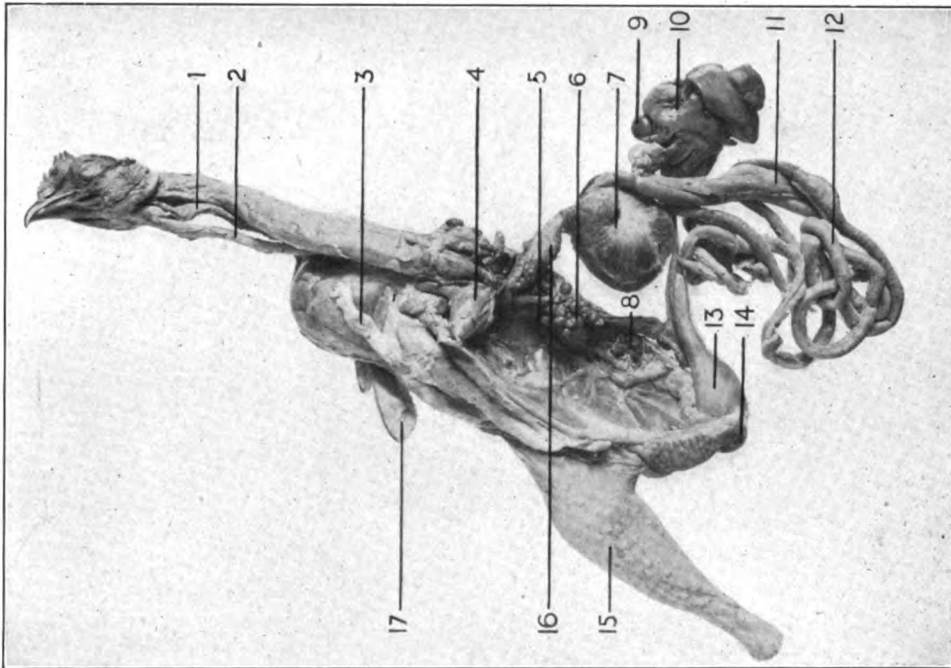
25. Catarrh or Cold

An inflammation of the upper air passages caused by exposure to colds, draughts and confinement in damp quarters. **Symptoms.** Discharge from the nostrils, difficult breathing, and frequent sneezing, especially in the early stages.

This condition occurs most often in the fall. Pullets affected may not lay as soon as they otherwise would. The flock recently put into winter



FIG. 408. Chicks affected with bacillary white diarrhea. Note dumpy appearance.

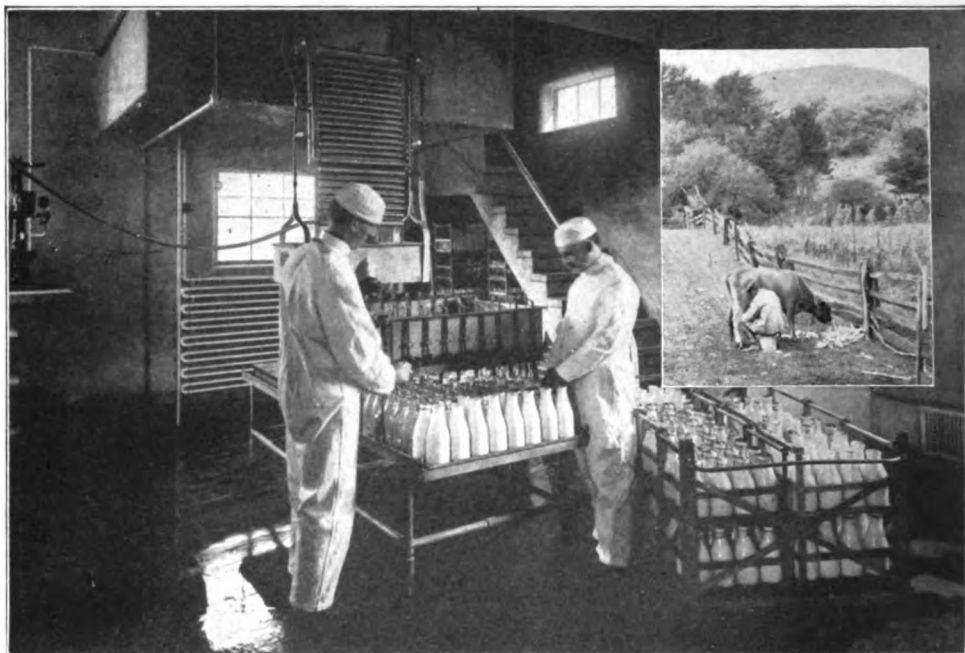


A hen with one side removed to show internal organs (See p. 337), from a dissection made especially for FARM KNOWLEDGE. 1 gullet; 2 windpipe; 3 crop; 4 heart, 5 lung, 6 ovaries; 7 gizzard; 8 kidney; 9 spleen; 10 liver; 11 pancreas; 12 intestines; 13 cloaca; 14 vent; 15 leg; 16 stomach; 17 wing.

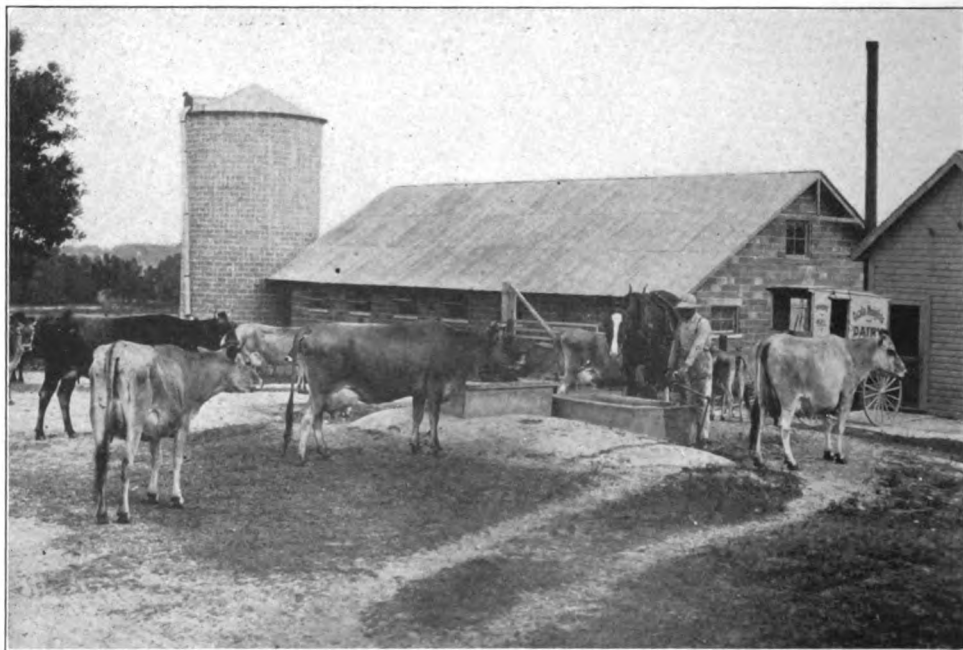


Ground bone and other animal feed makes poultry strong, vigorous, and able to often "fight off" gape worms and other troubles

KNOWLEDGE OF THE FOWL'S BODY, ITS PARTS, AND THEIR OPERATION IS ESSENTIAL TO SUCCESSFUL FARM DOCTORING



Two extremes in the development of dairying activities——



And a typical, modern, sanitary dairy farm of medium size

DAIRYING IS DAIRYING WHETHER THE HERD IS OF ONE COW OR A HUNDRED

quarters should be carefully handled and watched for signs of disease.

Treatment. (1) Remove cause. (2) Squeeze out discharge. (3) Dip heads in a saturated solution of boric acid.

Bronchitis is a severe form of the above condition affecting the lower air passages. All there is to do is to destroy the affected birds.

26. Chicken Pox

Symptoms. The same as those of roup (p. 348) except that pus scales appear upon the comb and unfeathered portions of the head. In rare cases the scabs appear without the other symptoms. **Cause.** Unknown. As in the case of roup, exposure to cold and damp are predisposing causes.

Treatment. Same as for roup, except that the pox scabs should be removed and areas painted with lysol. Good results are often obtained by injecting a vaccine made from the pox scabs. Write your agricultural experiment station about this.



FIG. 409. Chicken pox scabs on rooster's comb and wattles. (Nevada Bulletin 84).

A fungus or mold skin disease causing few deaths, but serious monetary loss because of its lasting ill effects upon the bird.

Symptoms. Small grayish-white spots appear, first, on the unfeathered parts of the head. These enlarge, form crusts or scales, and if not treated may in a few weeks spread to the neck and thence to the body. The feathers become brittle and drop off. When the patches are small, little ill effect is noticed, but as the disease progresses the birds may become depressed, and if enough of the body surface is affected, death results.

Treatment. (1) If possible, isolate all affected birds. (2) Remove the scales and rub thoroughly into affected parts an ointment made as follows: Heat 1 half pint Mason jar full of vaseline until just melted; then add 1 tablespoonful formaldehyde; cover immediately and shake until vaseline becomes solid. Usually 2 applications at intervals of 5 to 7 days will suffice. Tincture of iodine, lysol and other remedies have been recommended, but experience has shown that formalised vaseline is far superior.

28. Fowl Cholera

An acute, infectious and usually fatal disease affecting old and young birds alike, and

caused by a germ (*Bacillus Avi Septicus*)

Symptoms. Sometimes the affected birds die before any symptoms are noticed. Usually, however, a diarrhea with highly colored yellow or green droppings is observed. The feathers become roughened, the wings droop; in many cases there is intense thirst. The crop becomes paralyzed and distended with food. Drowsiness and in many cases a deep sleep is noticed which may last for several days. Sometimes nearly all the birds die within a few days or week; or the deaths of a few at a time may occur over a long period. If a dead bird is opened, inflammation of the kidneys and digestive organs is seen; blood streaks may be present on any of the internal organs and almost always are on the heart; the liver may show whitish areas.

How spread. How the germs gain entrance to a flock cannot always be determined. Frequently the introduction of infected birds is the cause. Unfortunately some birds from infected flocks, although apparently recovered, become carriers of the germs and infect others. The germ gains entrance to the digestive tract of individuals through food and water.

Treatment. (1) Kill and burn all affected birds, being careful not to spill any of the blood on the premises. (2) If possible, separate the remaining birds into small groups, so that they may be easily watched and any sick birds removed. (3) It is usually best and most economical to dispose of the average flock if infected. (4) Clean and disinfect (p. 339). A specially prepared serum is used in European countries on very valuable birds, but it would not be practicable for the average flock. In case fowl cholera occurs in your flock get in touch with your agricultural experiment station for advice and help.

29. Fowl Typhoid (*Infectious leukæmia*)

A blood disease of chickens caused by a germ and first described by Dr. V. A. Moore.

Symptoms. Marked depression; the membranes about the head are pale in color; diarrhea is rarely observed. Death usually results in from 1 to 5 days after the onset of the symptoms. If the bird is opened, the liver is usually found enlarged and covered with small gray areas. **Treatment.** The same as for fowl cholera, and see Bureau of Animal Industry Reports 1895-1896.

30. Pip

Symptoms. Dry scab or crust appears on the tongue; bird breathes through the mouth; condition is disturbed generally because of impaired eating and breathing. **Cause.** Injurious effects of cold or catarrh. The dry, scaly tongue is caused by constant breathing through the mouth necessitated by obstruction of the nasal passages. Most frequently

seen in young birds that have been improperly housed. Treatment. (1) Remove the cause and treat as for cold (p. 344). (2) Paint the scab with glycerine and remove it when this can be done without wounding the membrane.

31. Pneumonia

Is rarely seen as a primary disease and is not contagious. It usually follows a severe cold. Symptoms. Nasal discharge which may be brown in color; depressed condition as shown by ruffled feathers, drooping wings and labored breathing. The act of breathing apparently causes great distress and is often accomplished through the mouth. Diarrhea may be present. If a dead bird is opened, an inflamed condition of the air passage is seen; the lungs are either very dark red or light gray, depending on the stage of the disease; and pus may be found in the lungs or windpipe or both. Treatment is unsatisfactory. Treat the cold while mild.

32. Roup

A contagious, catarrhal inflammation of the air passages and membranes of the mouth and eyes, presumably caused by a germ which, however, has never been isolated. Undue exposure to cold and dampness are predisposing factors. Symptoms. Requiring careful observation. A period of depression lasting from a few hours to a day, followed by inflammation of the eye, which may be closed and is usually filled with tears. A thin, watery discharge from the nostrils may just precede or follow the eye symptoms. As the disease advances one or both eyes become badly swollen, and the sinuses (pockets) below them become distended. The nasal discharge thickens; pus patches and sometimes false membranes appear in the mouth; the appetite may be lost. If both eyes are affected, the bird cannot see to eat. The mortality sometimes is only 1 or 2 per cent, at other times as high as 50 per cent. Pox scabs often appear in cases which otherwise would be called roup. Whether roup and chicken pox are caused by the same organism is at present disputed.



FIG. 410. Swelling under eye caused by chicken pox infection. When thus badly infected a bird should be killed and burned. (Nevada Bulletin 84),

Treatment. (1) Remove affected bird. (2) Dip the heads of those not affected in a mixture of 1 part of a

saturated solution of potassium permanganate and 4 parts of water. If it is desired to treat the affected birds: a. Squeeze pus from the nasal passages. b. Open pus pockets with sharp knife at lowest point and squeeze out contents. c. Remove pus patches and paint with pure lysol. d. Dip head of bird in the potassium permanganate solution. e. Put boric acid in the affected eyes.



FIG. 411. A case of roup showing swelling under the eye. (Me. Special Bulletin).

33. Tuberculosis

Is a slow, progressive disease caused by a specific germ, commonly known as "going light" and chiefly affecting chickens and turkeys.

Symptoms. Unthriftiness indicated by ruffled feathers, droopy appearance and paleness of comb and wattles. Affected birds often are lame and gradually lose flesh, although retaining appetite to the last; the affected bird often is less than half normal in weight. After death the liver usually is found enlarged and covered with light gray spots from the size of a pin head to $\frac{1}{4}$ inch in diameter. The spleen usually is similarly affected. Nodules may be seen on the intestines. The lungs rarely are affected.

Treatment. (1) Kill and burn all average birds visibly affected. (2) Dispose of remainder of the flock. (3) Clean and disinfect (p. 339). (4) Keep no birds for one year. (5) Very valuable flocks may be tested (see tuberculin test below).

How spread. Droppings of affected birds contain germs and infect the premises. Other fowls then are infected through the feed and drinking water. It is believed that sparrows and pigeons may become infected and carry the disease from farm to farm. Infection may result from feeding the offal of birds purchased at butcher shops.

Introduce only birds from healthy flocks and prevent contact with neighboring flocks which may be infected.

The tuberculin test. Recently a modification of the tuberculin test has been adopted for testing fowls. It consists in the injection with a fine hypodermic needle of a specially prepared tuberculin just beneath the outer skin of the wattle. About 4 drops ($\frac{1}{4}$ cubic centimeter) is the dose for the average sized bird. If the bird is tuberculous, one or both wattles will swell in 12 to 48 hours, from 2 to 20 times normal size. Birds in the advanced stages fail to react.

Avian (fowl) tuberculosis, so far as is known at present, is not communicable to man, nor do cattle or swine contract tuberculosis from chickens. Statements have appeared to the

effect that because both chickens and cattle on the same farm were tuberculous, one must have infected the other. The occurrence of both diseases at the same time is merely a coincidence. Experiments have failed to infect cattle and hogs with fowl tuberculosis by the ordinary methods.

34. Vent Gleet

An inflammation of the last portion of the bowel (*Cloaca*) doubtless caused by bacteria though no particular germ has yet been isolated. Symptoms. In the early stages a red swollen condition of the lining membrane, followed in a few days by an offensive smelling discharge; the feathers around the vent become soiled and the skin reddened. In cases of long standing the skin may become ulcerated. Often the general health is undisturbed but the foul odor attracts attention to the disease. Treatment. Destroy affected common stock; treat valuable birds as follows: (1) Remove soiled feathers and cleanse area around vent. (2) Apply vaseline to the skin beneath vent. (3) Inject a saturated solution of boric acid twice daily with a syringe.

Parasites

35. Depluming Scabies

Loss of feathers caused by the depluming mite (*Sarcoptes loeves*) which lives at the base of the feathers. Symptoms. The feathers fall off in patches or from all parts of the body, often beginning at the rump and extending forward. Treatment. Apply ointment composed of 1 part flowers of sulphur and 3 parts vaseline. Repeat, if necessary.

36. Fleas (*Pulex Gallinae*)

These live in the litter around filthy runs and injure and annoy the fowls by sucking their blood, usually at night. They are seldom found on the birds in the daytime, though they can usually be discovered if



FIG. 412. How to dust a hen for lice or other parasites

search is made in the litter. The constant irritation causes loss of weight and consequent reduction in the egg yield. To remove them cleanse and disinfect the runs.

37. Lice

Lice (*Mallophaga*) are found on nearly all species of poultry. The

eggs or nits are laid on down or feathers and hatch in 6 to 10 days. When undisturbed, they multiply very rapidly and in a short time become a serious pest.

In chicks lice infest the head; in adult birds they live on the body and among the feathers. Symptoms. Constant picking at feathers; failure to thrive; drooping of wings, especially in young birds. Setting hens often leave the nest. Death sometimes results.

Treatment. (1) Grease the top of the baby chick's head with lard or vaseline. (2) Dust sitting hens with insect powder at least twice during the hatching period. (3) Apply blue ointment below the vent of all other adult fowl. (4) Put dust baths in houses.

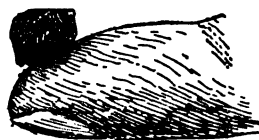


FIG. 413. The amount of blue ointment used to kill lice on one hen. Natural size. (Conn. Bulletin 86).

38. Mites

Mites (*Acarina*) are considered the worst of the external parasites of poultry. They breed very rapidly, especially in the spring and summer. The eggs are concealed in the filth of roosts or nests. Care should be taken to keep the houses free from mites as they occasion serious losses.

There are several varieties, the worst being the common or red mite, which infests sleeping quarters and nests, crawls upon the fowl while on the nest or roost and causes injury by sucking the blood.

Symptoms. Unthriftiness, loss of weight and picking at the feathers—much the same in general as those seen in lousiness. The ravages of mites are much worse than those of lice and death not infrequently results.

Treatment. (1) Cleanse and disinfect the house, yard, etc. (2) Spray roosts and droppings-boards thoroughly with a mixture of 3 parts of kerosene and 1 part of coal tar disinfectant every two months or oftener. (3) Paint all roosts and supports with a commercial wood preservative.

39. Scaly Leg

An accumulation of scales or crusts on the unfeathered parts of the leg, caused by the scaly leg mite (*Sarcoptes mutans*), which burrows, lives, and breeds under the scales of the leg.

Symptoms. Unthriftiness and sometimes lameness. Treatment. Scrub legs thoroughly with soap and water, and dip in a mixture of equal parts of kerosene and raw linseed oil.



FIG. 414. Leg of fowl with scaly leg. Note thickened, roughened condition. (Me. Special Bulletin).

40. The Air Sac Mite (*Cytodites Nudus*)

Lives in the bronchial tubes and air sacs.

Symptoms. The presence of small numbers may cause no noticeable disturbance. Large numbers cause ruffled feathers, loss of appetite, reduction in weight, frequent sneezing and coughing, and the comb and wattles become pale in color. Large numbers in the bronchial tubes may cause suffocation. If a dead bird is opened, the mites can be found as small whitish particles in the air passages in the midst of a fluid which is secreted as a result of the irritation they cause.

Treatment. None is recommended. Dispose of all birds. Clean and disinfect and start again with fresh stock.

41. Coccidiosis

A germ disease of the intestinal tract, most serious in young birds, although old birds frequently succumb. Blackhead in turkeys is caused by a coccidium. Chickens may harbor forms which to them are not harmful; but where chickens and turkeys inhabit the same runs, blackhead is more liable to appear than when turkeys are kept by themselves.

Symptoms. Dullness, diarrhea and loss of weight, the appetite frequently remaining good. Infected birds may live for a long time and recover but birds which have apparently recovered may subsequently die very suddenly. After death the liver may be found to contain small, light-colored areas, the large intestine to be inflamed, and that portion of the intestine next to the liver both inflamed and thickened.

Treatment. Isolate all sick birds and, if possible, divide the remainder into small groups so that sick birds may be more easily detected. Cleanse and disinfect (p. 339). If these methods do not suffice, dispose of all chickens and start anew, preferably on fresh ground.

42. Gapes

Gaping is caused by worms (*Syngamus Trachealis*) in the windpipe. Young chickens and turkeys are most susceptible. Symptoms. The bird coughs, sneezes, loses appetite, becomes weak and gapes. Diarrhea sometimes is present. On examination small forked worms are found in the windpipe, either white or red, according to the amount of blood they contain.

Treatment. If the bird is valuable, try to remove the worms. (1) Open mouth with thumb and forefinger. (2) Extend head in straight line with neck. (3) Carefully insert a horse hair doubled to form a loop. (4) Twist and withdraw with entangled worms and repeat until all have been removed. If the birds are of only average value, destroy and burn all of them; remove and burn all litter; and cleanse and disinfect houses. Adult fowls may harbor gape worms without apparent injury to themselves, but may infect chicks. If a flock is badly infested, dispose of all birds and keep no chickens for one year. (Mr. F. H. Valentine, a practical New Jersey poultry raiser, reports that chicks may be successfully raised on gape infested land if it is thoroughly treated with slaked lime. Another preventive measure that has proved successful consists of giving the chicks finely chopped onions or asafetida in a moistened mash once daily. Either of these plans makes unnecessary the killing of the stock and the loss of a year.—Editor.)

43. Worms

Sometimes the digestive tract of the fowl becomes so badly infested with tape or round worms of several varieties that serious disturbance is produced, especially in young birds. Symptoms. Loss of appetite, diarrhea, pale color of comb and wattles, feathers ruffled. Young birds frequently succumb. **Treatment.** (1) Kill affected birds and open the intestinal tract to determine the kind of worm present. (2) For round worms give 2 grains of santonin per bird, dissolved in water and mixed in the mash. (3) For tape worms give powdered areca nut, 40 grains per bird mixed in mash. (4) Cleanse and disinfect poultry house (p. 339). (5) Do not attempt to raise young chicks on infected ground as they are more susceptible than adults. (6) Hatch chicks in incubators, if possible, and in any case brood them on ground not used by adult fowls. Allow as little intercourse between growing chicks and adult fowls as possible. If a place becomes very badly infested with worms, dispose of all birds, plow and crop runs where possible and keep no birds for one year.



FIG. 415. Taking the dog's pulse by placing the hand over the heart just beneath the point of the elbow

CHAPTER 31

Common Diseases of Dogs and Cats

By DR. W. REID BLAIR of New York, whose extensive practice as a specialist in dog diseases supplements a wide, varied and intensely practical experience gained as Veterinarian of the New York Zoological Park during the past 15 years.—EDITOR.

THE common diseases of dogs and cats are due in many, if not most, cases to wrong management, incorrect feeding or unsuitable surroundings. Perhaps the greatest need in the lives of animals kept as pets is more exercise, but this is rarely, and need never be, the case on the farm. While practically all large and useful dogs are hardy and generally get too little rather than too much outdoor air, they all need shelter occasionally, and this should be dry and free from draughts. Puppies, especially, suffer and are often permanently injured in damp, chilly sheds or basements. While a half-starved dog or cat will eat almost anything that comes its way, there are feeds that are good and others that are bad for it, the same as with any other animal. Study Chapter 15 on how to care for the dog and page 173 on the care of the cat, follow the directions given and, except for now and then an unpreventable case, you will be able to avoid most of the troubles described here, which may be listed as follows: Of the digestive system—*Gastritis, Enteritis, Dysentery, Constipation, Worms*; of the respiratory system—*Bronchitis, Snuffles*; of the nervous system—*Fits*; of the joints, bones, and muscles—*Rheumatism, Rickets*; of the skin, etc.—*Mange, Ringworm, Lice, Fleas*; of the system in general—*Distemper*.

Gastritis, Enteritis, Dysentery

These diseases being closely related can be discussed together and their differences pointed out. *Gastritis* is inflammation of the *stomach*; *enteritis* or diarrhea is inflammation of the *small intestine*; *dysentery* is inflammation of the *large intestine*. The common causes of all three are generally unsuitable feed (too coarse or bulky or too stimulating), sour or spoiled feed, foreign matter such as stones, sticks, worms, etc.

Symptoms. Vomiting is a common sign of an overloaded stomach and generally sets things right. It is also the most important symptom when the stomach is inflamed. There is little or no appetite and

what feed is taken is generally vomited up in 10 to 15 minutes. At first the vomited material resembles white of egg; later it becomes ropy mucus with yellowish streaks; in severe prolonged vomiting it may contain

more or less greenish yellow bile. The animal is dull, depressed, or uneasy; frequently changes its resting place; groans; whines and shows signs of colicky pain. The breathing is hurried and the abdomen appears tender.

In *enteritis*, vomiting is generally absent, the appetite is poor and there is always diarrhea. In mild cases the discharge is pasty, in severe attacks it becomes watery, slimy, sometimes tinged with blood, occasionally frothy and usually with an offensive smell. Pressure on the abdomen causes the animal to show tenderness or pain, whereas in simple indigestion the colicky pains are appreciably lessened by massaging the abdomen.

In *dysentery*, the bowel discharges are generally fluid, black in color, frequently blood-stained, and generally passed at short

intervals without effort. At this stage the animal becomes very weak, and emaciation is rapid.

Treatment. Dieting is enough in many cases. Protect the mucous membranes of the stomach and intestine from irritation by giving no bulky feed which is difficult to digest. The best feed is finely chopped raw beef given often and in small quantities. White of egg with a teaspoonful of blackberry brandy may be given in a little milk or gruel. If pain is severe, give 5 grains of Dover's powder. If vomiting persists give 5 to 10 grains of subnitrate of bismuth every 2 hours. A few drops of tincture of opium in a little barley water is of value when the stomach is very sensitive. Prevent if possible excessive drinking of water.

In treating for *acute diarrhea* or *dysentery*, it is always wise to give first a dose of castor or olive oil to free the bowels from irritating substances. Give no solid food. The white of eggs beaten up with milk, and a teaspoonful of blackberry brandy or beef juice together with oatmeal, rice gruel, or barley water should be the principal feed for the first few days. For *dysentery* take the same precautions in regard to feed which should be given in small quantities and easily digested. Don't let the animal exercise.

Return to solid feed gradually and carefully since the stomach and intestinal membranes remain in a very sensitive condition for a considerable period after these affections. Lime water at the rate of a teaspoonful to 4 ounces of warm milk is of great benefit while the stomach is sensitive.

Constipation, Costiveness, Impaction of Bowels

Constipation or costiveness is a common trouble in old dogs and cats and indicates insufficient emptying of the bowels. Anything that tends to interfere with their normal action may cause it—for example, close confinement, lack of exercise, dry, concentrated, bulky, or indigestible feed, limited drinking water, irregular feeding hours, gluttonous swallowing of masses of meat and bones, etc.

It may result from chronic indigestion (which is merely a symptom of a deranged stomach) and other disorders of the stomach, intestines, and liver in old fat dogs and cats; and also from the licking of the coat when the hair is shedding and the swallowing of the hair, which, if the bowels are sluggish, collects and blocks up the stomach or intestines. An obstinate form of constipation is seen in hunting dogs, caused by feeding on game (especially rabbits) of which the bones and fur form a hard dry mass in the bowels.

Symptoms. The leading symptoms are the passing of a small amount of dry hard feces after considerable straining, with signs of severe pain, loss of appetite, occasional vomiting, and distention of the abdomen. The course of the disease varies according to the degree of obstruction present and the success of the treatment adopted.

Treatment. Unless relief is promptly afforded, complications such as poisoning set in, caused by the imprisoned material or the inflammation of the small bowel. In mild cases success generally follows a full dose of castor oil and syrup of buckthorn equal parts, and

injections of warm water. In acute constipation frequently repeated rectal injections of warm soapy water, warm olive oil and glycerine help by softening hard, dry fecal masses. In cases of obstruction don't use violent purgatives; lubricate the canal with repeated small feedings of chopped raw beef mixed with Russian mineral oil or olive oil.

Daily doses of cod-liver oil are useful in all cases of chronic constipation. If the condition is merely the result of inactive intestines, give daily doses of 3 to 5 grain tablets of cascara sagrada buried in the

meat of the morning meal. For the cat a 5 grain compound rhubarb pill, raw liver, or sardines in oil are all useful. Give oil laxatives 2 or 3 times daily in small doses, rather than in one large dose. To pre-

vent constipation avoid the chief causes—lack of exercise and improper diet. Meat should be well cooked and fed with plenty of vegetables such as spinach, boiled carrots, beans, etc.

Worms

The dog and cat harbor a considerable variety of round worms and tape-worms in their stomachs and intestines. While many of these are harmless, there are several intestinal parasites which are fatal. For instance, a small round worm (hook-worm) less than half an inch long, produces the disease of "*pernicious anemia*," sometimes called "hook-worm disease," which may be so serious as to wipe out entire kennels or packs of hounds.

Symptoms. Animals affected with this disease gradually become weak and bloodless and lose flesh in spite of a good appetite. The coat becomes rough, and the skin red and scaly. Often there is a thick discharge, which may be bloodstained, from the nose. Small hemorrhages occur at irregular intervals and there are present swellings of the legs, and general indications of wasting disease. Diarrhea is nearly always present, the discharge containing much blood and mucus. The disease may last 2 or 3 months or even longer and is most fatal in young puppies under 4 months of age. The writer has seen many deaths from it in puppies less than 30 days old. Puppies or dogs that have died of it show numerous small hemorrhages in the small bowel, among which in many cases the parasites will be found attached to the mucous membranes.

Treatment. Before giving vermifuges (worm medicines) try to improve the dog's general condition. Give good rich feed such as scraped raw beef, milk, and eggs, and tonics, such as arsenic, iron and strychnine. The drugs which have proved most serviceable in treating this disease are: *thymol*, in 5 grain doses, *kamala* in 20 to 30 grain doses, and the extract of male shield fern in 15 to 25 drop doses, followed by castor oil and syrup of buckthorn. Wherever the disease occurs isolate the affected animals to prevent its spread and disinfect all bowel discharges to destroy the eggs of the parasites. Keep the kennel clean and dry, and the feeding dishes clean.

Other Worms

Young animals are likely to show symptoms of the ordinary worms (*Ascarides*) of the stomach or intestines, while older dogs may harbor the parasites without giving any signs. Puppies may become infected very soon after birth, and in from 3 to 4 weeks may be found vomiting or passing worms, several inches long. Most patients are from 1 to 4 months old.

Symptoms. An affected puppy does not thrive although the appetite may be greatly

increased. The breath is bad; the abdomen may become distended ("pot bellied"). Later the coat appears rough, flesh is lost, and the appetite becomes irregular. If many worms are present a catarrh of the small intestine (shown by diarrhea) develops. In many cases the puppy has fits or convulsions soon after eating, and frequently shows colicky and other signs of abdominal pain.

Treatment. In treating for these common worms it is important that the patient should fast for a short time before medicines are given so that these may exert their full cura-

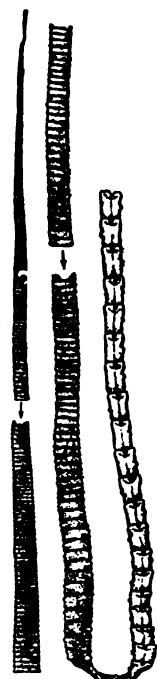


FIG. 416. An adult tape worm from the intestine of a dog. One half natural size. (Bulletin 260, U. S. Dept. of Agr.)

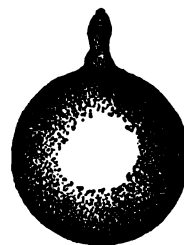


FIG. 417. A bladder worm infesting domestic animals from which develops the tape worm of the dog shown in Fig. 416. (Bulletin 260, U. S. Dept. of Agr.)



FIG. 418. Adult tape worm that develops in the dog from the bladder worm found in the brain of giddy sheep. See Fig. 389. (Bulletin 260, U. S. Dept. of Agr.)

tive value. For full grown dogs, santonin, male shield fern, and freshly powdered areca

nut are all used with good results; for young puppies under 3 months of age wormseed oil is very safe and effective. Take care to burn or disinfect the droppings after treating worms. If brood bitches are suspected of harboring parasites they should be treated before they become heavily pregnant.

Tapeworm. In treating for tapeworm let the animal fast for from 10 to 20 hours giving a dose of castor oil several hours ahead of the medicine. Areca nut and the extract of oil of male shield fern will be found the most reliable destroyers of tapeworm. One hour after giving the drug which kills the parasites and loosens their hold, give the dog a large dose of castor oil to expel them.

Bronchitis

An inflammation of the mucous membrane of the tubes connecting windpipe and lungs. When the smaller bronchial tubes are involved, it is termed "capillary bronchitis," this form being most common in very young animals suffering from distemper, and very old or run-down dogs. Bronchitis may come from inhaling irritating dust, exposure in cold and damp quarters, and sudden changes in temperature.

Symptoms. Quick, wheezing breathing and frequent and prolonged coughing, the cough being at first dry, but later moist and thick. The eyes become inflamed, and there is usually considerable sneezing, with nasal discharge. The heart beats are greatly increased, and if the ear is placed to the animal's chest, a moist rattle is heard. The animal is soon prostrated, and unless speedily relieved, quickly dies of pneumonia or suffocation.

Treatment. Put the animal in a comfortable atmosphere, free from draughts or dampness. Mild cases are relieved by inhalations of a soothing steam from a pail of boiling water or an ordinary bronchitis kettle. Let the steaming last only a few minutes, but repeat it several times a day. Rub the throat and chest well with warm camphorated oil. A chest jacket of flannel is always beneficial, and the inhalation of compound tincture of benzoin, or eucamphol in water, at the rate of a tablespoonful to a cup will be found useful. When the cough is very troublesome, give 3 grains of Dover's powder, or a teaspoonful of Brown's mixture several times a day.

Chronic Nasal Catarrh, Snuffles in Cats

This is a bad smelling, nasal discharge which is usually associated with the gradual death of small areas of tissue in the membranes of the nasal passages and sinuses (cavities) of the head. The disease is most frequently seen in Angora and other long-haired cats, but may occur in any breed, commonly as a sequel of distemper. It may also result from infection of certain bones in the nose, obstruction by growths in the nostrils, diseased teeth, tuberculosis, foreign bodies such as pins and needles in the nasal passage, and fracture of the nasal bones.

Symptoms. The animal frequently snuffles and snorts, throwing out from the nose a quantity of thick jelly-like or yellowish discharge resembling mucus and pus which may be streaked with blood. The breathing is generally obstructed. The skin over the region of the nose may be thickened or en-

larged, later losing its hair. A large swelling may appear at the point of this swelling, come to a head, break through the skin and discharge a bloody, pus-like mixture. Sometimes an abscess appears in the inner corner of the eyelids.

There is not much change in the general condition of the animal so long as the ap-

petite remains good, but as the disease is generally of a chronic nature, and as affected animals cannot often be properly treated, the complaint is difficult to remove, and frequent relapses occur. Animals often become unsightly because of the disgusting discharges from the nostrils.

Treatment. The emptying of the abscesses and thorough washing out of the nasal passage is desirable, but this procedure is

violently resisted by most cats, and cannot be satisfactorily carried out except by the veterinarian. The teeth, especially the canine teeth, should be carefully examined and if found diseased should be extracted. The breathing of steam medicated with tincture of benzoin gives temporary relief. Make affected animals live out-of-doors, but give them shelter and protection from dampness and cold draughts.

Fits, Convulsions, Epilepsy

Fits. Result from irregular discharges of the nerve cells, which are in an unbalanced condition. They occur unexpectedly, last a variable time, and consist of either one prolonged muscular contraction, or alternate contraction and relaxation. They may be due to injuries to the head or the spinal cord or morbid states of the blood, as in poisoning caused by eating spoiled meat or fish; or they may appear in the advanced stages of infectious diseases such as distemper, or in connection with the presence of worms. The commonest cause in dogs and cats is irritation produced by stomach and intestinal parasites. Among the emotional causes, fear easily heads the list.

Symptoms. The attack is usually sudden and unannounced. The animal stops, trembles, cries, and falls; it may manage to arise but instantly falls again. The limbs stiffen, tremble or twitch; the head is extended or drawn rigidly to one side or jerked violently, striking the ground. The mouth is generally open, but may be constantly champing, and frothy saliva may flow abundantly from it. The body may be rigid, or alternately twisted in different directions. The eyes roll or squint, and the breathing is noisy and difficult. Insensibility is complete. Toward the end of the attack there may be an involuntary discharge of urine or feces. The attack usually lasts 2 or 3 minutes, the convulsions gradually lessening and finally ceasing, when the animal raises its head, opens its eyes and gazes inquiringly about. In some cases it gets on its feet, shakes itself, and appears perfectly normal; in other cases the recovery is slower. The animal

may remain dull and stupid for half an hour or longer, or in trying to regain its feet may appear to have little control over the leg muscles, staggering about as if the legs were benumbed. Or it may remain prostrate and fall into a deep sleep marked by snoring.

Treatment. Put the animal in a dark closet to prevent its injuring itself or running away while mentally unbalanced. Don't throw hot or cold water on it, except in the case of heat stroke. In cases due to stomach or intestinal worms the first step must be their removal (p. 353). During a convulsion a rectal injection of 10 to 15 grains of chloral hydrate in a tablespoonful of warm milk will cut an attack short, and put the animal in a quiet sleep almost immediately.

Use medicines that are quieting or tonic to the nervous system; the bromides of sodium and potassium are best. Given at night in 5 and 10 grain doses, these tend to induce a quiet sleep, with brain rest and recuperation.

Rheumatism

Muscular rheumatism may be regarded as an acute, infectious disease of which the causes have never been fully determined. Of all the various theories that have been brought forward, the recent view that the disease depends on the presence of a micro-organism (germ) seems the most plausible. Formerly, exposure to cold, chills, and dampness were regarded as the chief causes, but at the present time such influences are believed to be merely factors making the animal more liable to take the disease.

Symptoms. Muscular rheumatism is of frequent occurrence in the dog, affecting the muscles of the back and loins and often of the abdomen. A characteristic symptom in the dog is the acute pain shown when the animal is handled, or even if an attempt is made to pick it up. When the muscles of the neck are affected they appear swollen, the head and neck being held stiffly. The jaw

muscles may be involved interfering with eating, and if attempts are made to open the mouth, the animal shrieks with pain. Constipation is a frequent symptom; on account of the pain accompanying movements, the animal avoids the act as much as possible. When the muscles of the back and loin are affected the dog walks with stiff hind legs, and goes upstairs with great difficulty. In severe cases, especially in very old and fat dogs, partial paralysis of the hind legs occurs. Muscular rheumatism in the dog runs an irregular course, and there is a marked tendency toward a recurrence of an attack. A severe case may become chronic and continue for an indefinite period.

Treatment. It is always well to begin the treatment of muscular rheumatism with a mild purgative of calomel or castor oil. Salol, salicylate of sodium, aspirin, and bicarbonate of soda are then the most useful drugs in treating a dog. If the pain is very great, give daily 5-grain doses of Dover's powder. Apply to the outside of affected parts warm applications of camphorated oil and chloroform liniment or an ointment containing oil of wintergreen. Feed lightly, avoid starchy feeds such as potatoes, rice, or pastry, and include 1 to 2 teaspoonfuls of olive oil daily. Encourage the dog to drink buttermilk freely.

Rickets or Rachitis

This is a disease caused by the bones of young animals remaining soft. Almost without exception it occurs only during the first year of life, and most frequently when puppies are only a few months old, or soon after being weaned. It is seen in all breeds, but most often in large dogs such as St. Bernards, Newfoundlands, Great Danes, and Setters. The chief causes in the dog and cat are confinement and a lack of lime and phosphorus in the feed. The development of rickets is a slow process and there is usually a period of ill-health and faulty nutrition before any changes in the bones can be recognized.

Symptoms. Among the first symptoms are an awkward, painful gait, weakness and a variable appetite. The animal may gnaw wood, drink manure water, and show signs of other abnormal cravings. The aching in the bones, which occurs before they

change in shape, causes it to lie down much of the time and to dislike to rise; when made to walk it appears stiff or lame. It frequently staggers and even falls down, and often has convulsions. The changes in the form of the bones, at least in the beginning, are most striking in the long bones of the legs. The ends near the joints enlarge; and the animal walks on the outside of the foot-pad. The weight of the body, and the pull of the muscles cause the bones to bend and become crooked. The backbone changes from a straight line, becoming either arched, with the bones prominent, or depressed, causing a "saddle back" appearance. The bones of the face may swell and bulge out, giving the animal a dull, stupid expression. Bronchitis, indigestion, nervous symptoms, and skin irritations bring the animal to an exhausted condition, and death is hastened by various complications.

Rickets may be mistaken for acute muscular rheumatism, but it must be remembered that rickets develops slowly and gradually, while rheumatism comes on suddenly and involves no bulging and bending of the bones, and except in the chronic form, no enlargements at the joints.

Treatment. Keep the animals in moderately warm and well-ventilated quarters, and in the open air when the weather is favorable. Provide large runs and give feed rich in bone-forming materials such as mutton, lamb, beef, fish, milk, and plenty of bones. Milk with lime water added should be given freely and weaned animals should receive a liberal meat diet with plenty of bones. Phosphated cod liver oil is a good daily tonic.



FIG. 419. Case of rickets in a puppy. Note the deformed feet and enlarged joints

Skin Diseases and Parasites

What they are; how to know them. While skin diseases are not usually fatal of themselves, still they may so undermine a dog's constitution that he easily falls victim to some fatal malady. Skin diseases may be caused by parasites,

either vegetable, like that causing ringworm, or animal, like that causing mange. They may also be of non-parasitic origin like eczema which, in a large proportion of cases, is a constitutional disease and not contagious.

Follicular mange, sometimes called red or black mange, is due to slender animal mites which burrow into the skin glands and sacs from which the hairs grow, where the females lay eggs. From these hatch larvae or grubs that finally develop into adult parasites. While not as highly contagious as the form next described, this mange is more serious and much harder to cure.

Sarcoptic mange is caused by mites much larger than the follicular type, and which, instead of burrowing into the skin glands and hair follicles, are confined to the surface of the skin or merely burrow under its outer layer. This form of mange is highly contagious.

Ringworm is caused by a vegetable parasite or fungus which invades the hair roots, causing inflammation and rendering the hair brittle so that it breaks off. It is contagious to man and other animals and every effort should be made to prevent its spread. To distinguish this from sarcoptic mange remember that in the latter the itching is intense, while in ringworm the disease spreads rapidly but the skin lesions are not so severe.

Eczema is a constitutional disease, rare and hard to recognize. Nearly all so-called "eczemas" are merely the result of skin parasites above mentioned.

Symptoms. Certain changes in the skin caused by the biting and burrowing of parasites are symptoms common to all parasites, the larger more familiar forms described farther on as well as those causing the diseases now being discussed. Generally there is increased temperature, followed by redness of the part, loss of hair and itchiness. As a result of the rubbing and scratching induced by the irritation there is a thickening of the skin and a formation of scales.

The symptoms of *follicular mange* vary greatly. The parts usually affected first are the elbows, back, and areas around the eyes. As the lesions increase in size the hair falls out, and the skin becomes reddened, then thickened. Small pimples which turn into pustules now appear, the skin wrinkles, and the affected limbs swell. If the pustules are squeezed a yellowish, blood-stained fluid oozes out. The irritation varies in different individuals but is never as severe or noticeable as in sarcoptic mange. The progress of the disease is usually slow and if allowed to continue affects the general condition and health.

Sarcoptic mange generally appears first on the head especially about the muzzle, ears, and eyebrows, and later on the chest, elbows, and belly; within a week or two the whole body may be affected. After exercise or when the animal is near the fire the irritation becomes more marked. A peculiar smell of mice is generally noticed about dogs suffering from this trouble. There is always a great deal of scratching, rubbing, and biting, the affected parts often being greatly injured thereby.

Symptoms of *ringworm* are irritation and circular bald patches on the skin, slightly

elevated at their edges and covered with dry, grayish scabs.

Treatment. No matter what form of mange is present, there are several broad principles to act on. Isolate affected animals to prevent infection of others, and remove and burn all bedding which may contain parasites. Clip (and then burn) the hair from the affected parts (or the entire body) of long haired dogs, and wash the animal with tincture of green soap in warm water, or remove the scabs with a warm solution of washing soda. After drying thoroughly apply ointments or lotions as directed below. Badly affected animals should have about one-fourth the body dressed each day; the fifth day bathe the entire body and begin again. House well, give good care and frequently disinfect the infected quarters. When the disease is far advanced it is wisest to destroy the animal.

For *follicular mange* mix creolin, 2 ounces, balsam of Peru, 3 ounces, extract of male shield fern, 1 ounce, with 1 pint of alcohol and apply to the affected parts and rub well into the skin every second day. Vaccines prepared in the laboratory from germs taken from the affected animal have been used on some bad cases with good results. However, the outlook for a permanent cure of this mange is rarely bright and in many cases treatment seems of little use. Even in mild cases which recover, the

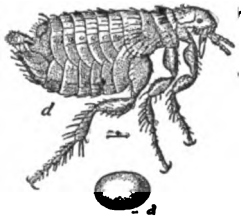


FIG. 420. Common dog flea. *a* egg; *d* adult flea. Both much enlarged

treatment is full of difficulties and disappointments, for no sooner is one part better than another breaks out and when this is apparently cured the old lesion starts afresh.

For *sarcoptic* mange use sulphur 1 part

and vaseline 4 parts. Storozal ointment will cure many cases, and creolin 1 ounce, balsam of Peru, 2 ounces and olive oil, 12 ounces make a good mange lotion.

For *ringworm* use Iocamfen or strong tincture of iodine.

Lice are blood-sucking parasites frequently found on dogs and cats, with the life-histories much like those of the mange mites. The female sticks the small end of each of her pear-shaped eggs or "nits" to the base of a hair by means of a gummy substance. After a few days the young and complete parasite escapes from the large end of the "nit" and soon becomes mature and able to reproduce. Lice, being blood suckers, cause much irritation when biting. To destroy them, bathe the animal in a warm, strong solution of bicarbonate of soda, then apply a mixture of 1 part kerosene to 4 parts olive oil.

Fleas are reddish brown, wingless insects with oval bodies and rounded heads. Their life history may be completed on the body of the host, but the parasite usually breeds in bedding, rugs, etc. Their bites cause a great deal of irritation, making the animal scratch and bite its skin in trying to dislodge them, and often causing severe inflammation. Fleas are easily removed from an animal by a thorough washing in a coal tar solution. But since the eggs are generally laid in cracks and crevices of the floor, the sides of the kennel, and in the bedding, these places must be thoroughly cleansed with the solution to get rid of the eggs and larvae. If an animal has but few fleas, fresh Persian insect powder dusted into the hair, and scattered around the sleeping quarters may be all that is necessary.

Canker of the Ear

Canker or inflammation of the inner part of the outer ear is found more often in the dog than in any other domestic animal. It may be caused by irritating diet, or by water getting into the ear, either while swimming or when the dog is bathed and the ear not properly dried afterward. Eczema and a small skin parasite are also the cause of many cases of canker. If not checked, the disease may extend both inwards and outwards, and cause deafness by reaching the ear drum.

Symptoms. The dog feeling uncomfortable may shake the head, scratch and rub the ear or hold the head with the affected ear downward. Pain is shown by cries and yelps when the ears are handled. A closer examination shows a

brownish, sticky discharge with a peculiar pungent odor, oozing from the ear and caking the hair around the openings. If the base of the ear is gently pressed, a sucking sound is heard, and the animal shows signs of pain.

Treatment. First remove all sources of irritation by cleansing. Never wash out the ears with liquid since it always produces great pain; but cleanse the ear passages with cotton swabs dampened with peroxide of hydrogen or alcohol. After the ear has been thoroughly dried with absorbent cotton, dust into it a dry dressing such as powdered boracic acid, oxide of zinc, or Xeroform. In order to



FIG. 421. Taking a dog's temperature with an ordinary dairy thermometer held between his lips and his teeth

prevent injury to the ear by scratching, it is well to cover the hind-foot of the affected side with a soft cotton "stocking bandage."

In some cases where the ear tends to develop dry scabs, the application of zinc or adrenalin ointment is useful. While the inflammation is acute and the ears very painful, dress them daily; later once in 3 days is enough.

Distemper

Distemper is an acute, contagious disease that tends to run a definite course but which is frequently complicated by inflammation of various organs of the body. It is the most common and most fatal malady of dogs, and has been well called the "scourge of the kennel." The cause is probably a special germ although the early invasion of numerous other bacteria and the effect of their poisons account for the various complications so often seen.

Distemper is usually a disease of young animals, most frequently attacking dogs under a year old. All dogs do not take it when exposed to infection, and, as a rule, the older the dog the greater its chance of escape. A dog that has distemper and recovers is usually immune to future attacks. Anything that tends to lessen an animal's resistance, like exposure to wet and cold, exhaustion, or the exciting and unnatural conditions at dog shows where large numbers of dogs are crowded together, increases its chances of taking the disease.

Symptoms. These vary greatly depending upon the severity of the attack, the animal's powers of resistance and the rapidity with which the disease progresses. The first noticeable symptoms are dullness, a great dislike to play or exercise, and a decided preference for warmth, the dog crouching before the fire. Loss of appetite, thirst, fever, vomiting, dry, hot nose, chills, and a harsh or husky cough may all occur.

There is a redness of the eye and a watery discharge from the nose and eyes. This later becomes thick, resembling mucus and pus, filling up the nostrils, sticking the eyelids together, and causing the animal much discomfort. There may be twitchings, fits of various kinds, or symptoms of paralysis of the hind limbs, all of which show the effect of the poison on the nervous system. In many cases the eyes are seriously affected, a bluish-white cloudiness appearing in them. This gradually extends and deepens until an ulcer is formed, which by penetrating the cornea may result in more or less permanent blindness. However, many such cases, although of an alarming appearance, do well under appropriate treatment. A constant symptom in all cases of distemper is rapid loss of flesh and strength.

In a large percentage of cases the skin shows a peculiar pustular eruption. Small nodules develop on the inner surface of the thigh, and on the belly and later change to purulent vesicles (blisters containing pus). These dry to brown crusts or burst, leaving reddened, moist spots, which later become covered with scabs. Finally the scabs drop off, and the reddish spots disappear.

Treatment. Put the affected animal in a

clean, uniformly warm place, protect it from draughts, and, if possible, give it concentrated nourishment. Milk and eggs and chopped raw beef fed in small quantities, several times a day, should be the main feed during the active stages of the disease. Inject (or have a veterinarian do it) the anti-distemper serum obtainable from several of the prominent drug houses as early in the course of the disease as possible.

If the fever is very high give several doses of aspirin at intervals of 5 hours; for depression and weakness, quinine or blackberry brandy may be put in the milk and egg.

Treat the catarrh causing the discharge from nose and eyes by making the dog inhale warm medicated vapors—the steam from hot water containing such things as eucamphol or compound tincture of benzoin. Camphorated oil rubbed into the skin over the chest and covered with a flannel jacket will often relieve congestion of the lungs. If there is vomiting, it may be controlled by giving repeated doses of salicylate or subnitrate of bismuth, or arsenate of copper. If there is diarrhea, give salol, charcoal, bismuth and bicarbonate of soda. To stimulate a failing appetite tonics of tincture of cinchona or gentian and nux vomica are advised. Doses will vary with the size of the dog. See Chapter 32 or get the advice of a veterinarian who knows dogs.

When the eye symptoms (conjunctivitis) are present, bathe the eyes several times daily with warm solutions of boric acid; after the acute symptoms have passed a 1 per cent solution of zinc sulphate may be used. For severe inflammation of the eyeballs with threatened ulceration apply a warm boric acid solution followed by a 1 per cent

solution of atropin or dionin to relieve the severe pain. For clearing away the cloudiness in the cornea, apply "conjunctivitis ointment" (Mulford) or the yellow iodide of mercury ointment (1-50) after the acute symptoms have subsided.

If nervous symptoms appear give bromide

of potassium and bromide of sodium. Paralysis may be treated with massage, alcohol rubs, the application of electricity, and arsenic and strychnine internally.

The skin rash does not usually require any special treatment, but powdered zinc oxide or boracic acid will assist in healing the lesions.

Prevention. Since affected animals easily infect others, they should be kept away from healthy young dogs and cats; the place where they are kept should be thoroughly disinfected and the bedding burned after the recovery or death of the patient. There are on the market several vaccines for immunizing young dogs liable to be exposed to infection, some of which appear to be of great value.

Operating on a Big Dog

Summer before last my Great Dane cut the pad of one of his fore feet very deeply. It healed at the bottom, but the lips of the wound spread and now resemble a "quarter crack" in a horse. Horny calluses have developed, cause him great pain and make him walk on the outer edge of his foot. There is no good veterinarian available, but a surgeon friend of mine says he will operate, paring down the edges of the wound and sewing the lips together. But we don't know whether to use ether, cocaine, or what, or how to tie him down. I have the impression that anesthetics are dangerous for dogs. What can I do?

H. R. F. Norwich, N. Y.

For the adult dog chloroform and ether are both safe and reliable, but since no anesthetic is fool-proof, there must always be some risk attached to their use by a layman or amateur. It would be inhuman to attempt to operate without some anesthetic and in addition the surgeon would find it impossible to control the animal. I would offer and can recommend as safe, the following:

1. Prepare the dog by giving an ounce of castor oil and syrup of buckthorn (equal

parts) the evening before the operation, and give no feed for 10 hours before operating.

2. About an hour previous to operating give a hypodermic injection of 2 H.M.C. tablets (each containing hyocine 1/100; morphine $\frac{1}{4}$; cactoid 1/64).

3. Half an hour before operating give another injection of 2 more tablets.

The hypodermic injection usually produces vomiting in 5 to 10 minutes. Within 30 minutes after the second the dog will be dull and drowsy and will not object to being placed on the table in the abdominal position and secured by tying each leg fast to a table leg. In many cases no further anesthetic is necessary, but if the animal objects

to the handling or feels pain, give it a few whiffs of chloroform, slowly, largely diluted with air, and only enough to

prevent the reflex actions. The chief advantages of this method are (a) the emptying of the stomach, (b) the small amount of chloroform required, and (c) the sound sleep that the dog enjoys after the operation. In this case, in addition to the soft bandage, there should be applied a soft leather stocking with a slightly thicker piece for the sole pad, to be worn while the wound is healing.

W. REID BLAIR.



FIG. 422. A dog that is constantly confined or prevented from wearing down its toenails on roads and rough ground must occasionally have them trimmed. However, don't cut them too short!



CHAPTER 32



DRUGS AND DOSES FOR FARM USE

By DR. A. S. ALEXANDER (See Chapter 26). Chapters 26 to 39 of this volume supply information and directions that enable the farmer to recognize and treat many of the troubles that affect his animals. This equipment and knowledge make it necessary that he know something also about the medicines used for animals' diseases and how to make and use the simpler mixtures and compounds. This chapter lists these drugs and prescriptions and some rules and data that have to do with their use and handling. According to the kinds of animals he keeps, the nature of the diseases that are most common or serious on his farm, and the availability of expert aid and a well equipped drug store, each reader can determine what materials and what amounts of each should be included in his "veterinary medical chest."—Editor.

Weights and Measures

The two systems of measurements employed in dispensing drugs, are:

1. APOTHECARIES' WEIGHT

1 Grain						(Written by Druggists) Gr.
20 Grains =	1 Scruple					
60 " =	3 Scruples =	1 Dram				
480 " =	24 " =	8 Drams =	1 Ounce			
5,760 " =	288 " =	96 " =	12 Ounces =	1 pound		

2. APOTHECARIES' LIQUID MEASURE

1 Minim (drop)						(Written by Druggists) m
60 Drops =	1 Dram					
480 " =	8 Drams =	1 Ounce				
7,680 " =	128 " =	16 Ounces =	1 Pint			
15,360 " =	256 " =	32 " =	2 Pints =	1 Quart		
61,440 " =	1,024 " =	128 " =	8 " =	4 Quarts =	1 Gallon	

Approximate Measures

- 1 Teaspoon holds about 1 dram.
- 1 Dessertspoon holds about 2 drams.
- 1 Tablespoon holds about one half ounce.
- 1 Wineglass contains about 2 ounces.
- 1 Tumbler contains about 8 ounces or one half pint.
- 1 Teacup or coffee cup contains from 5 to 8 ounces.

How to Make Solutions and Mixtures

Directions for making solutions and mixtures may (1) list definite amounts such as drops, ounces, pints, etc.; (2) list parts, by weight or bulk, of the total mixture; (3) call for a percentage solution; or (4) state the proportions of the materials used, as 1 to 1,000, 1 to 5,000, etc. The first two methods need no explanation or figuring. Tables for working along the two last mentioned lines are as follows:

1. PERCENTAGE TABLE

PER CENT.	GRAINS PER OUNCE	GRAINS PER PINT	DRAMS PER PINT	GRAINS PER QUART	DRAMS PER QUART	GRAINS PER GALLON	DRAMS PER GALLON	OUNCES PER GALLON
0.1	0.5	7.7	0.1	15.4	0.3	61.4	1.0	0.1
0.2	1.0	15.4	0.3	30.7	0.5	122.9	2.0	0.3
0.3	1.4	23.0	0.4	46.1	0.8	184.3	3.1	0.4
0.4	1.9	30.7	0.5	61.4	1.0	245.8	4.1	0.5
0.5	2.4	38.4	0.6	76.8	1.3	307.2	5.1	0.6
1	4.80	76.80	1.28	153.60	2.56	614.40	10.24	1.28
2	9.60	153.60	2.56	307.20	5.12	1222.80	20.48	2.56
3	14.40	230.40	3.84	416.80	7.68	1843.20	30.72	3.84
4	19.20	307.20	5.12	614.40	10.24	2457.60	40.96	5.12
5	24.00	384.00	6.40	768.00	12.80	3072.00	51.20	6.40

2. PROPORTION TABLE

1 to 100 solution	. 1½ dr. to 1 pint
1 to 500 solution	. 15 grains to 1 pint
1 to 1,000 solution	. 7½ grains to 1 pint
1 to 2,000 solution	. 7½ grains to 1 quart
1 to 4,000 solution	. 7½ grains to 2 quarts

A saturated solution is one containing all the solid drug or chemical boiling water will dis-

solve; that is it is so strong or concentrated that a little of the crystals or powder remains in the bottom of the vessel.

A normal solution of any material is of a known strength based on its chemical weights and other characters. The normal salt solution, which is the one that the farmer should use, is made by dissolving 1 heaping tablespoonful in a quart of moderately cool water.

How To Regulate Doses

For young animals. The following tables, for which we are indebted to Quitman's *Materia Medica*, show what proportions of a full dose should be given to animals of different ages. The dose for the aged animal referred to as "1 part" is given after each drug in the list beginning on page 367.

HORSES

3 years old and upward, 1 part
From 1½ yrs. old to 3 yrs., ½ part
From 9 to 18 months old, ¼ part
From 4½ to 9 months old, ⅛ part
From 1 to 4½ months old, ⅙ part

SHEEP

2 years old and upward, 1 part
From 1 to 2 years old, ½ part
From ½ to 1 year, ¼ part
From 3 to 6 months, ⅛ part
From 1 to 3 months, ⅙ part

CATTLE

2 years old and upward, 1 part
From 1 to 2 years old, ½ part
From ½ to 1 year, ¼ part
From 3 to 6 months, ⅛ part
From 1 to 3 months, ⅙ part

SWINE

1½ years and upward, 1 part
From 9 to 18 months old, ½ part
From 4½ to 9 months, ¼ part
From 2½ to 4½ months, ⅛ part
From 1 to 2 months, ⅙ part

DOGS

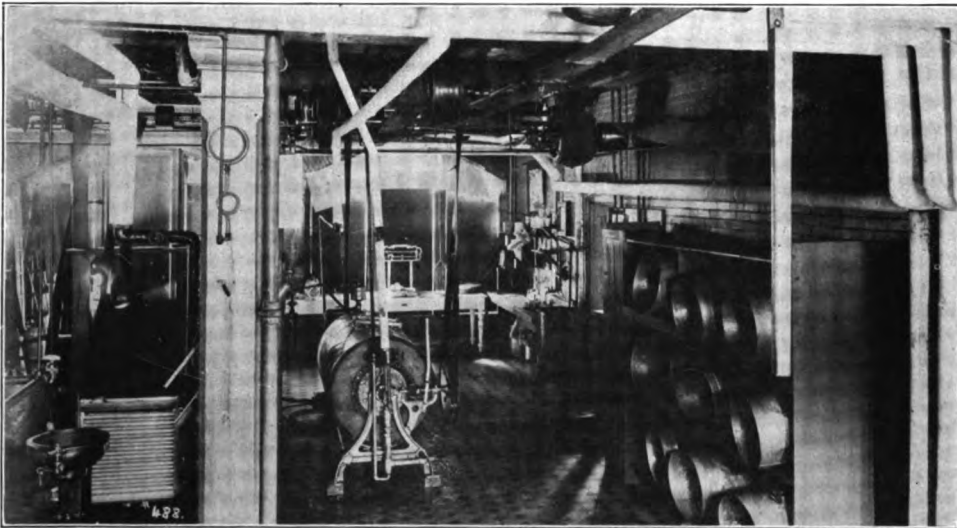
From 20 to 45 days, ¼ part
From 10 to 20 days, ⅙ part

For different animals. For a horse the average dose of most fluid extracts and powdered drugs is 1 dram. This does *not* include alkaloids which are concentrated and powerful. The average dose of a tincture is about 1 ounce, but this does *not* include poisons.

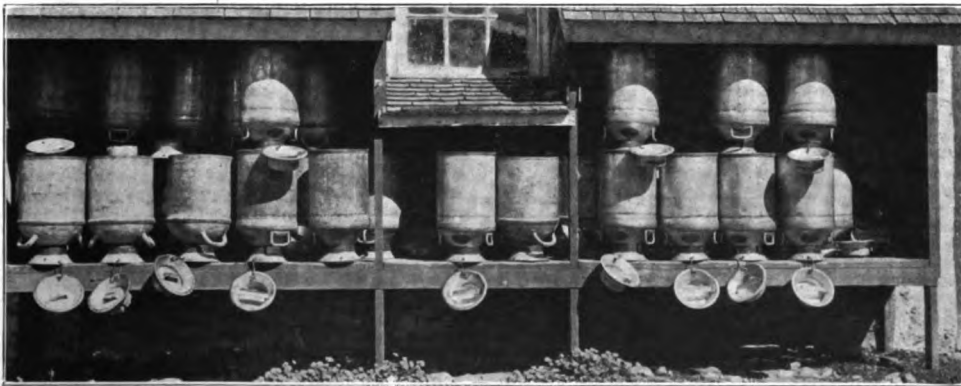
Cattle take one quarter to one half more than the average dose for a horse; a sheep or goat takes one half more than a pig; a dog takes one half more than a cat. Or, relatively, doses for these animals are: horses, 1; cattle 1½; sheep and goats ⅔; swine ⅔; dogs ⅙; cats ⅙.



Clean cows, clean buildings, and clean attendants put the responsibility for dirty milk on "the other fellow"

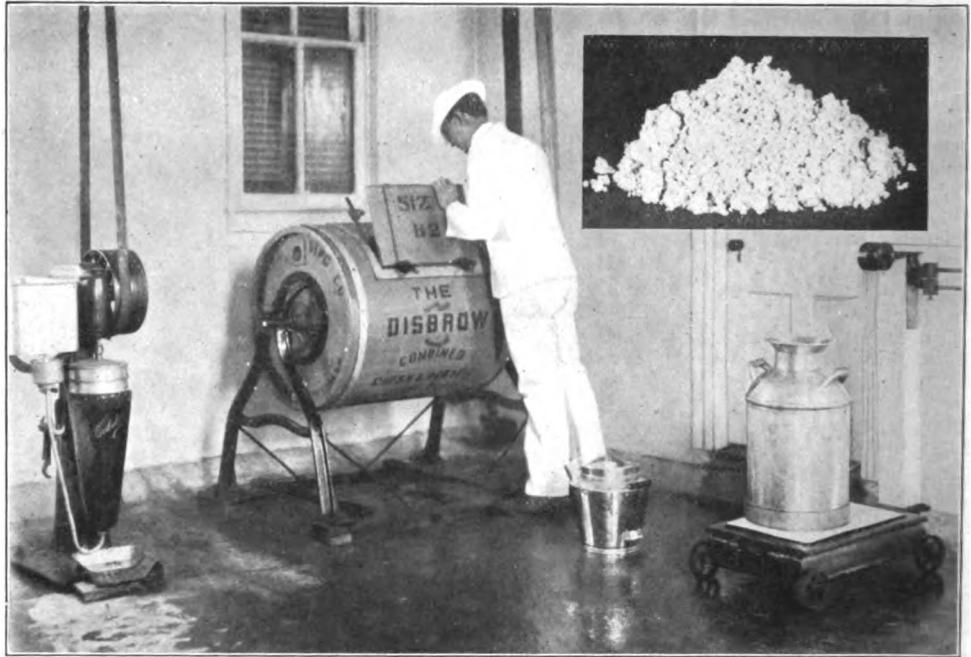


System, sanitary construction, and sterilization are at the bottom of successful creamery management



Sunlight is the greatest germ killer known

CLEANLINESS AND SUNLIGHT ARE FUNDAMENTAL FACTORS IN SUCCESSFUL DAIRYING



Good surroundings for good buttermaking. Insert shows butter as it should appear fresh from the churn



As long as its patrons support it heartily, so long will a creamery or cheese factory return them a dividend

FOR BOTH PRODUCER AND CONSUMER BUTTERMaking IN THE CREAMERY IS MORE PROFITABLE THAN BUTTERMaking ON THE FARM

In general the average dog takes about the same dose as a man; a pig takes twice, a sheep or goat 3 times, and a horse 16 times as big a dose as a man.

How To Give Medicine

Powdered drugs are given to the animal in its feed which should be dampened. If the drug has a disagreeable taste or smell it may be given in a gelatine capsule or mixed with molasses or strained honey and placed on the back teeth with a wooden paddle. Sheep reject strongly drugged feed. Pigs are less sensitive.

Powerful concentrated drugs are dissolved in water and injected by means of a hypodermic syringe (Fig. 423) under the skin, or into a vein, or the windpipe. Soluble salts may in some instances be given in the drinking water. Larger doses are administered in water as a "drench." Fluid combinations of medicine, in doses not greatly exceeding 2 ounces, may be given gradually with a $\frac{1}{2}$ ounce, strong nozzleed, short barreled, hard rubber syringe. Medicines are sometimes given also in the form of a ball, or paste, or mixed in the animal's salt.

How to drench a horse (Fig. 426). (1) Back the animal into a stall. (2) Place the running noose of a small, soft rope around the upper incisor teeth inside of the lip. (3) Throw the free end of the rope across an overhead beam or have it pass through a pulley apparatus. (4) Moderately elevate the head and hold it there by means of the rope. (5) Stand on a box or chair at the horse's right side. (6) From a strong-necked bottle pour an ounce or two of the medicine into the right corner of the horse's mouth, *never into the nostrils*. (7) If it is not promptly swallowed rub the roof of the mouth with the fingers or neck of the bottle, but do not pull out the tongue or squeeze the throat. If that fails, pour a teaspoonful of cold water into a nostril. (8) Let the head down instantly for a few minutes if the horse coughs. (9) Give repeated small doses in this way until all is administered.

How to drench a cow (Fig. 427). (1) Secure her in stanchions or to a fence post. (2) Stand on her right side, pass the left hand over her face and into her mouth. (3) Hold her head in a straight line with her body. (4) With the bottle held in the right hand pour successive small doses of the medicine into the corner of her mouth. (5) Free her head if she coughs. (6) Give the drench very slowly and carefully. Never try to drench an unconscious cow. She cannot swallow and the fluid is likely to flow into the lungs and cause fatal suffocation.

How to drench a sheep (Fig. 428). (1) Stand on the sheep's right side if large, or straddle it if small. (2) Place the left hand on the left lower jaw and the thumb in the mouth on top of the tongue, holding the head straight but not high. (3) Slowly pour the medicine into the right corner of the mouth in successive small doses until all is swallowed. Be careful not to impede easy swallowing by pressing on tongue, jaw, or throat.

How to drench a hog. (1) Put a twitch on the snout, or apply a running noose and snub the hog up to a post. (2) Give the medicine slowly from a bottle having a rubber hose fitted on its neck; or cut a hole in the toe of an old shoe or rubber, thrust this into the hog's mouth and pour in the medicine. It is seldom necessary to dose hogs this way.

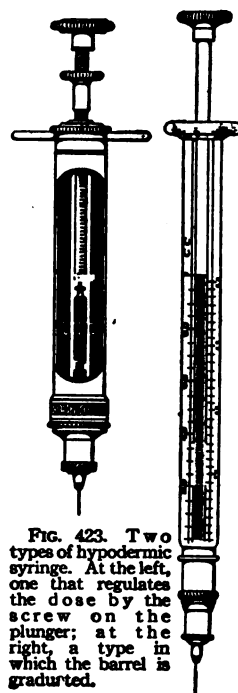


FIG. 423. Two types of hypodermic syringe. At the left, one that regulates the dose by the screw on the plunger; at the right, a type in which the barrel is graduated.

How to Give Injections

Injections by means of the rectum are called *enemas*; sometimes "high enemas" are specified when it is necessary that the liquid be introduced far into the intestines rather than merely in the first few inches. Rectal injections

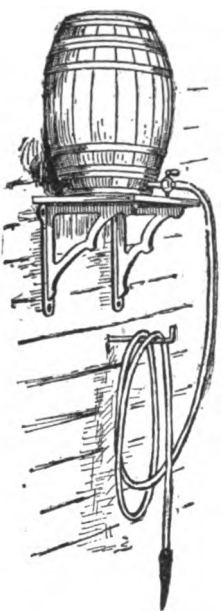


FIG. 424. A convenient permanent arrangement for giving injections where considerable stock is kept. (See also Fig. 476).

Veterinarians use a special metal return flow catheter for this operation.

are given by means of 2 feet of clean 1-inch rubber hose oiled and carefully passed inward; pour the fluid into a funnel fitted into the free end of the hose which should be bent upward during the operation. Or use a veterinary injection pump, or a large clyster syringe.

Injections into the vagina of the mare may be given by means of a clean fountain syringe and long hard rubber nozzle, or a long half-inch rubber tube fitted into a spout let into the rim of a large clean pail which is hoisted well above the hind quarters of the cow (Figs. 424 and 476).

Uterine (womb) injections are given in the same way, but a second tube is inserted at the same time to syphon off the fluid.

How to Apply Poultices

Poultices are made of such substances as hot flaxseed meal, oatmeal, boiled and mashed roots, or clay. Add bran to keep flaxseed from sticking. Mix 2 teaspoonfuls of coal tar disinfectant per pint of hot water in making a poultice that is to go on a wound. Poultices of cow manure, and other filthy or unsterilized substances, are very likely to carry germs which may easily infect and poison wounds and seriously endanger the life of the animal. They also provide highly favorable

conditions for the growth of any germs already present on or under the surface of the body where the poultice is applied. Under no circumstances should such materials be used.

How to apply a poultice to the jaws or throat. Tear 8 or more long tails on each end of a long, wide strip of new, unbleached muslin. Tie them together with bow knots in front of the eyes, across the forehead, back of the ears and farther back to hold the cloth snugly up to the jaws and throat. Then untie the tails back of the ears, pack the poultice material into place with the hand, and retie the tails. Have the poultice about the stiffness of soft clay, not mushy. Renew it as soon as it cools.

How to Apply Plaster Casts

Plaster of Paris bandages may be bought at a drug store, but are easily made from strips of new cheese cloth 3 to 5 yards long and 3 inches or so wide, upon which fresh "dental plaster" is thickly sprinkled while the bandage is being rolled.

Bandage the injured part lightly with cheese cloth; then soak the plaster bandages

in soft water containing a little alum and apply them like any other bandage. Have ready a pound or two of the dental plaster made into a paste with water and smear some of it with the hand on top of each turn of the bandage so that when two or



FIG. 425. Many-tailed bandage in place to hold poultice.

more bandages have been put on the cast will be half an inch thick or more and strong and rigid when it dries. An oily string may be wound on with each bandage to make its removal easier, or acetic acid may be applied to soften the plaster so that it can be cut and removed.

Bandages, or strips of unbleached muslin, smeared with melted Burgundy pitch, may also be wound or stuck upon a part to which splints could not well be applied. Such a cast, built up of strips of muslin and layers of pitch, is most useful in treating a fracture of the shoulder blade, upper arm bone or thigh bone of a small animal.

Drugs and Medicines and Their Uses

In the approximate doses given for the different materials listed (which may also be figured out by means of the table above), gal. stands for gallon, qt. for quart, pt. for pint, lb. for pound, oz. for ounce, dr. for dram, gr. for grain, and m. for drop. If any of these materials cannot be obtained from local drug stores or other regular supply houses, write to your state experiment station for the names of dealers in veterinary materials.

Acetanilid or Antifebrin powder. Horse, 1 to 2 dr.; cattle, 2 to 4 dr.; sheep, 20 to 40 gr.; dog, 2 to 10 gr.; not commonly used for swine. Acts powerfully against fever; used to quickly reduce it in sunstroke and sometimes in influenza. Useful to dust on wounds.

Acetic acid. Gives the sour taste to vinegar. Use 1 oz. diluted acid in 1 pt. of water for itching skin; use full strength (glacial) acid to remove warts or other growths.

Aconite (tincture). Horse, 10 to 20 m.; cattle, 20 to 30; sheep, 10; dogs and pigs, 1 to 5. A dangerous poison especially when pulse is weak; used to slow the heart action. Useful at the outset of fever, especially in founder, lymphangitis and mammitis. Applied externally, in small quantities, relieves pain.

Alcohol (brandy, gin, whiskey). Powerful stimulant used to break up chills; in weakening diseases like influenza; or in pain, like colic. Dose (alcohol): horse, 1 to 2 oz.; cattle, 1 to 3 oz.; sheep, 2 to 4 dr.; swine, 1 to 2 dr.; dog, 15 m. to 2 dr.; of brandy, gin or whiskey give twice as much. Dilute alcohol with 6 times, and brandy, etc. with 2 to 4 times its bulk of water. Alcohol is used also as a disinfectant to cleanse the skin or a wound, and to bathe painful parts, as in rheumatism.

Aloes, Barbadoes. A powerful, bitter purgative, given as a "ball" to horses; or dissolved in raw linseed oil as a drench. Horse, $\frac{1}{2}$ to 1 oz.; cattle, 1 to 2; sheep, $\frac{1}{2}$ to 1 (salts are preferred for cattle and sheep); swine, 2 to 4 dr.; dog, 2 to 30 gr. (See Purgative Ball, p. 372).

Alum (astringent). Horse, 1 to 3 dr.; cattle, 2 to 4 dr.; sheep and pigs, 10 to 40 gr.; dog, 2 to 10 gr. Used internally for diarrhea, dysentery, red water, and founder; externally (in water) as a wash for sore mouth and piles or prolapsed rectum; in powder form as a drying powder; when dried (burnt) as a caustic for "proud flesh."

Ammonia, aromatic spirits of. Horse, $\frac{1}{2}$ to 1 $\frac{1}{2}$ oz.; cattle, 1 to 2 oz.; calves, $\frac{1}{2}$ to 2 dr.; sheep and pigs, 1 to 2 dr.; dogs, 5 to 60 m. A valuable internal stimulant, used, well diluted with water, in colic, bloat, and other digestive derangements; also externally as a liniment at the rate of 1 ounce per pt. of water.

Ammonia (common solution). Horse, $\frac{1}{2}$ oz.; cattle, 1 oz.; sheep, 2 dr.; pig and dog $\frac{1}{2}$ to 1 dr.; used well diluted with water as a stimulant, or in colic or bloating; excellent in liniments.

Antimony; Potassium tartrate, see Tartar emetic.

Apomorphin hydrochlorate. Much used as an emetic (to produce vomiting) for dogs; dose (hypodermic) $\frac{1}{16}$ to $\frac{1}{8}$ gr.; (by the mouth) $\frac{1}{2}$ to 1 gr.

Areca nut (powder). Destroys worms, especially in dogs. Horse, 1 to 1 $\frac{1}{2}$ oz.; dog, about 2 gr. per pound of body weight.

Arecoline hydrobromide (the alkaloid of areca nut). Quick acting purgative given with hypodermic syringe. Horse, $\frac{1}{2}$ to 1 $\frac{1}{2}$ gr.; cattle, $\frac{1}{2}$ to 2.

Arnica (tincture). Horse, $\frac{1}{2}$ to 1 oz.; cattle, 1 oz.; sheep, 2 dr.; pigs, $\frac{1}{2}$ dr. Promotes sweating in sunstroke or heat prostration; used externally in lotions for sprains.

Arsenic; Fowler's Solution. Composed of 1 part arsenious acid, 2 parts bicarbonate of potash, 3 parts compound spirits of lavender, 94 parts distilled water. Horse, 2 dr. to 1 oz. 2 or 3 times daily in drinking water or bran mash; cattle, $\frac{1}{2}$ to 1 $\frac{1}{2}$ oz.; sheep and pigs, 10 to 45 m.; dogs, 2 to 10 m. Used internally for heaves, chronic diseases of the skin, and chronic sores; internally and externally for warts. (May omit lavender for animals.)

Arsenious acid; White arsenic. Horse, 1 to 6 gr.; cattle, 2 to 8 gr.; sheep and pigs, 1 to 2 gr.; dogs, $\frac{1}{8}$ to $\frac{1}{4}$ gr.; must be well diluted. A dangerous poison; used (only on advice of veterinarian) for heaves; externally as a caustic in lumpjaw; in sheep dips; and for diseases of the skin.

Asafetida. A bad-smelling, nauseating (sickening) gum resin formerly much used for colic, now unpopular. Horse, 2 to 4 dr.; cattle, 4 to 8; sheep, 1; dog, 2 to 15 gr.; given in capsule or ball. The tincture (dose 1 to 4 oz.) also is given to the horse.

Atropin sulphate (the alkaloid of belladonna). An active poison given, combined with morphin, with hypodermic syringe by the trained veterinarian for colic, etc. Horse, $\frac{1}{2}$ to 1 $\frac{1}{2}$ gr.; cattle, $\frac{1}{2}$ to 2 gr.; dogs, $\frac{1}{16}$ to $\frac{1}{8}$ gr. In certain diseases a solution of 4 grains to the ounce of distilled water is used to dilate the pupil of the eye.

Belladonna; Deadly nightshade (fluid extract). Horse, $\frac{1}{2}$ to 1 dr.; cattle, 1 to 2 dr.; sheep 10 to 30 m.; pig, 2 to 10 m.; dog, $\frac{1}{2}$ to 2 m. Much used to allay pain (colic), and in diseases of the breathing organs. Also externally in sprains as a soothing liniment at the rate of 1 to 2 oz. per pint of water, and in eye washes at the rate of 30 m. to 4 dr. per pint.

Benzoin (compound tincture) or Friar's Balsam. One-half to 1 oz. per qt. of boiling water, useful for inhalation in bronchitis; also with glycerine, or in an ointment for sore teats, wounds, etc.

Bismuth Subnitrate (powder). Horse, 2 to 4 dr.; cattle, 4 to 8 dr.; swine and sheep, 20 to 40 gr.; dog, 3 to 20 gr. For diarrhea and vomiting.

Black haw; Viburnum Prunifolium (fluid



FIG. 426. Drenching a horse. See page 365

extract). Horse, 1 to 4 oz.; cow, 2 to 4 oz.; dog, 20 m. to 2 dr. Used to soothe inflamed womb and to prevent abortion.

Boracic or Boric acid. Horses and cattle 2 to 5 dr.; foals and calves, 20 to 30 gr.; dog, 5 to 20 gr. Used internally in diarrhea, cystitis and thick urine but more commonly as a mild antiseptic for eye wounds or eye disease.

Buchu (fluid extract or powder). Horse, 1 to 2 oz.; dog, 10 m. to 1 dr. Stimulate kidneys.

Calomel; Mild Mercurius Chloride. Horse, $\frac{1}{2}$ to 2 dr.; cattle, 2 to 4 dr.; sheep and pigs, 5 to 30 gr.; dog, $\frac{1}{2}$ to 10 gr. Purgative; also acts on liver. Best drug for thrush. Also used in eye disease of cattle.

Camphor, Gum. Horse, 1 to 2 dr.; cattle, 2 to 4 dr.; sheep and pigs, 10 to 40 gr.; dog, 1 to 10 gr. Dissolved in alcohol is used for sore throat, cough, cold, colic, and diarrhea; also used in liniments.

Cannabis Indica, or Americana; Indian hemp (fluid extract). Horse, 2 dr. to 1 oz.; in colic, $\frac{1}{2}$ oz. repeated in $\frac{1}{2}$ to 1 hour is average dose.

Cantharides; Powdered Spanish Fly or Blister Beetle. Used externally as a blister; 1 part to 4 or 8 parts of lard or lanolin.

Capsicum; Red pepper; Cayenne pepper (tincture). Horse, 2 dr. to 2 oz.; cattle, 3 dr. to 3 oz.; dog, 5 to 30 m. Used in colic and diarrhea; also in liniments.

Carbolic acid; Phenol crystals (a product of coal tar, liquid form containing 86.4 per cent phenol, the balance water). As disinfectant for wounds, etc., dissolve in water. Extremely dangerous for dogs and cats, internally or externally. Given, well diluted, to cows and mares to prevent abortion; dose, mare, 20 to 30 m.; cow, 1 to 2 dr.

Castor oil. Horse, 1 to 2 pt.; cattle, $1\frac{1}{2}$ to 3 pt.; sheep, 2 to 4 oz.; pig, 1 to 4 oz.; dog, 1 dr. to 2 oz. Give shaken up in milk as laxative or purgative.

Cascara sagrada (fluid extract). One-half to 2 dr. as a cathartic for dog.

Catechu (powder). Horse, 2 to 8 dr.; cattle, $\frac{1}{2}$ to 2 oz.; sheep, 2 to 4 dr.; pig, 1 to 2 dr.; dog, 2 to 20 gr. For diarrhea.

Charcoal, wood (powdered). Horse, $\frac{1}{2}$ to 2 oz.; cattle, 1 to 2 oz.; dog, 15 to 60 gr. Used for bloating, diarrhea, indigestion; and externally as a deodorizer in a poultice, or as a dressing powder.

Chloral hydrate (crystals). Horse, $\frac{1}{2}$ to 1 oz.; cattle, $\frac{1}{2}$ to 2 oz.; sheep, 1 to 2 dr.; pig, $\frac{1}{2}$ to 1 dr.; dog, 3 to 20 gr. Dilute with 12 times its bulk of water. Used internally diluted with 12 times its bulk of water as an anesthetic or sedative to dull pain and stop straining.

Chloroform. Mainly used to produce unconsciousness when inhaled; also in liniments and as a stimulant or for pain and spasms. Dose horses or cattle, 1 to 2 dr.; sheep or swine, 20 to 40 m.; dog, 2 to 15 m.

Chromic acid or Trioxid. Used in 5 to 10 per cent solution to cause sloughing in lump jaw, etc.; also for canker of the sole in horses.

Coal tar dip and disinfectant; Cresol Comp. (U. S. P.). Commercial dip and disinfectant; such as zenoleum, kreso, creolin, lysol, etc., used as a disinfectant and to kill parasites. The last two mentioned are German products at present (1917) practically unobtainable. Directions for use are supplied by the manufacturers.

Collodion, Flexible. Used (often combined with iodoform) as a varnish on wounds, leaking teats, fistula of the teat, etc.

Copper sulphate; Blue stone (crystals). Used mainly in powder form to cut down "proud flesh," and in solution for foot rot and obstinate wounds.

Digitalis (fluid extract). Heart stimulant to be given by a trained veterinarian only. Horse, 20 m. to 1 dr.; cattle, 1 to 2 dr.; sheep and swine, 5 to 15 m.; dog, $\frac{1}{2}$ to 3 m.

Epsom salts; Sulphate of magnesium. Horse, 12 oz. to 1 lb.; cattle, 1 to 2 lbs.; sheep, 4 to 6 oz.; swine, 2 to 4 oz.; dog, 1 to 4 dr. The most popular purgative for cattle and sheep; acts in 12 to 16 hours.

Eserine sulphate (alkaloid of calabar bean). Horse, $\frac{1}{2}$ to $1\frac{1}{2}$ gr.; cattle, 1 to 3 gr.; dog, $1\frac{1}{2}$ to 3 gr. Given with hypodermic syringe as a quick cathartic to stimulate muscular activity of the bowels.

Ether, Sulphuric. Horse, 1 to 2 oz.; cattle, $1\frac{1}{2}$ to 3 oz.; sheep and pigs, 2 to 4 dr.; dog, 15 to 60 m. Used as stimulant and pain queller in colic; also to cause unconsciousness when inhaled.

Ether, Spirits of nitrous; Sweet spirits of nitre. Horse, 1 to 3 oz.; cattle, 1 to 4 oz.; sheep, 2 to 4 dr.; pig, 1 to 2 dr.; dog, 15 to 60 m. Used to stimulate kidneys, and in fever.

Eucalyptus oil (and fluid extract). Used principally in boiling water to steam the head in bronchitis, sore throat, etc. Internally the extract is useful for dysentery: horse, $\frac{1}{2}$ to 2 oz.; cattle, 1 to 2 oz.

Formaldehyde (Formalin is a 40 per cent solution of formaldehyde gas in water). Powerful disinfectant for wounds in .5 to .75 per cent solution; for hands and instruments .5 to 1 or 2 per cent solution; for stables 20 per cent solution. Also given to cattle in small doses in water for bloat.

Gelsemium (fluid extract). Horse, 1 to 4 dr.; dog, 2 to 10 m. Nerve quieter, used to control delirium in azoturia and tetanus.

Gentian (fluid extract). Horse and cattle, $\frac{1}{2}$ to 2 oz.; sheep, 2 to 4 dr.; pig, 1 to 3 dr.; dog, 15 to 60 m. (powdered form). Horse and cattle, 2 to 8 dr.; sheep and pigs, $\frac{1}{2}$ to 3 dr.; dog, 2 to 20 gr. Used as appetizer and tonic for stomach.

Ginger (powder). Horse and cattle, 2 to 4 dr.; sheep, $\frac{1}{2}$ to 1 dr.; pig, 15 gr. to 1 dr.; dog, 5 to 10 gr. (tincture), horse and cattle, $\frac{1}{2}$ to 2 oz.; sheep, $1\frac{1}{2}$ dr. to 1 oz.; pig, 1 to 2 dr.; dog, 15 to 30 m. Stimulant, appetizer; used in colic, indigestion, and diarrhea.

Glauber salts; Sulphate of soda. As a

purgative: horse, 12 oz. to 1 lb.; cattle, 1 to 2 lb.; sheep, 2 to 4 oz.; pig, 1 to 2 oz. As a laxative $\frac{1}{2}$ to $\frac{1}{4}$ of these doses 2 or 3 times daily in water.

Glycerine. Two ounces in warm water is the best rectal injection in wind colic. Combined with carbolic acid, compound tincture of benzoin, tannic acid, etc., is used for sore teats.

Hydrogen peroxide. Pus destroyer for wounds, fistulas, abscesses, canker of the ear, etc. Dilute with an equal quantity of water.

Iodine (crystals). Horses and cattle, 15 to 60 gr.; sheep, 10 to 30 gr.; pig, 5 to 20 gr.; dog, $\frac{1}{16}$ to 1 gr. Used in diabetes. **Ointment** (4 per cent) composed of iodide of potash, 1 part; iodine crystals, 4 parts; water, 2 parts; benzoated lard, 93 parts; used to reduce swellings, kill ring worm parasite and promote healing of sores. **Tincture** (7 to 8 per cent) composed of iodine crystals, 70 parts; alcohol, 1,000 parts; injected into abscesses and fistulas and painted on glandular swellings, ringworm spots, forming splints, curbs and capped knees, hocks or elbows. **Lugol's Solution**, composed of iodine crystals, 5 parts, potassium iodide, 10 parts; distilled water, enough to make 100 parts, is used as a .25 to 1 per cent solution in water as a uterine and vaginal disinfecting injection.

Iodoform. Disagreeable smelling, yellow, disinfectant powder, containing 96.69 per cent iodine. Much used as dressing powder and in ointment carrying 10 per cent for sores, and ulcers.

Iron sulphate; Copperas (dried). Horse, $\frac{1}{2}$ to 1 dr.; cattle, 1 to 1 $\frac{1}{2}$ dr.; sheep, 8 to 60 gr.; pig, $\frac{1}{2}$ to 1 dr.; dog, $\frac{1}{2}$ to 2 gr. A tonic, blood builder, worm destroyer, and astringent in diabetes and chronic catarrh. **Iron sub-sulphate** (Monse's solution and powder) is used to stop bleeding.

Iron Chloride (tincture). Horse, 2 dr. to 1 oz.; cattle, $\frac{1}{2}$ to 1 $\frac{1}{2}$ oz.; sheep and pig, 10 to 30 m.; dog, 2 to 20 m. Given as tonic in bloodlessness and after weakening diseases; used externally to stop bleeding and diluted with 10 times or more its bulk of water as an astringent (contracting) antiseptic for vaginal and uterine injection.

Lead acetate; Sugar of lead. Extensively used as an astringent for healing wounds (see White lotion, p. 373). The *Subacetate* in 1 to 4 per cent solution (Goulard's Extract) is useful as a wash for sprains and inflamed skin.

Lime (prepared chalk form). Much used in diarrhea; horse and cattle, 4 dr. to 2 oz.; sheep and pig, $\frac{1}{2}$ to 2 dr.; dog, 2 to 30 gr.; foal and calf 10 gr. to 2 dr.; lamb, 3 to 10 gr. Makes whitewash.

Lime chloride or Chlorinated lime; Bleaching powder. Add $\frac{1}{2}$ lb. to each gallon of lime wash and use full strength in graves as a disinfectant, and as a deodorizer.

Lime water. Horse and cattle, 12 to 16 oz.; foal, $\frac{1}{2}$ to 1 oz.; calf, 1 to 2 oz.; dog, 1 to 8 dr. Much used to prevent and cure diarrhea.

Equal parts of lime water and raw linseed oil make "Carron Oil" excellent for burns.

Linseed oil (raw). As a purgative: Horse, 1 to 2 pt.; cattle, 2 to 4 pt.; sheep and pig, 4 to 10 oz.; dog, $\frac{1}{2}$ to 2 oz. As a laxative give half these doses. May be mixed in mash or slop.

Mercurial ointment; Blue ointment. Contains 50 per cent mercury (quicksilver), 25 per cent lard; 23 per cent suet and 2 per cent oleate of mercury. The *diluted ointment* contains $\frac{1}{2}$ of the blue ointment and $\frac{1}{2}$ lard. Used to kill parasites and in reducing glandular swellings. **Citrine ointment** composed of 70 parts of mercury, 175 parts of nitric acid and 760 parts of lard is used as a caustic, or, diluted with 1 to 5 parts of lard, for skin diseases, and still more diluted for chronic eye disease.

Mercuric biniodide, 1 part to 6, 8, or 10



FIG. 427. Drenching a cow. See page 365

parts of lard is effective as a blister for bony growths and enlargements.

Mercuric chloride; Corrosive sublimate. A powerful, dangerously poisonous disinfectant and caustic in convenient tablet form for making antiseptic lotions quickly; 1-500 to 1-2000 solutions for wounds. Especially good for nail pricks, foul wounds and fistulous tracts.

Mercuric oleate, containing 25 parts of yellow oxide of mercury and 75 parts of oleic acid, is very readily absorbed and excellent for chronic eczema and reducing chronic swellings.

Methylene blue; Pyoktanin. An antiseptic and astringent recommended for contagious abortion (See Chap. 36). Used also as a 1-100 to 1-1000 solution in water for wounds.

Morphine sulphate (alkaloid of opium). Given with hypodermic syringe by veterinarians to allay pain; horse, 2 to 4 gr.; cattle, 3 to 5 gr.

Mustard. Used as a counter-irritant in pneumonia and colic in paste form to be rubbed into the skin and washed off in 20 minutes. To cause vomiting in dogs give 1 to 2 teaspoonfuls in 1 or 2 oz. of water.

Nitric acid; Aqua fortis (10 per cent solu-

tion). Horse, 2 dr. to 1 oz.; cattle, 4 dr. to 2 oz.; sheep and pig, 15 to 30 m.; dog, 3 to 20 m. Given, well diluted with water, as a tonic to weak animals; also for sluggish liver. Externally is applied as a caustic to warts, ulcers, and malignant growths.

Nux vomica (fluid extract; dangerous poison). Horse, $\frac{1}{2}$ to 1 $\frac{1}{2}$ dr.; cattle, 1 to 2 dr.; sheep, 10 to 30 m.; pig, 5 to 20 m.; dog, $\frac{1}{4}$ to 5 m. Nerve tonic; appetizer; stimulates muscular action of the bowels. Valuable in paralysis, constipation, impaction, broken wind, and sexual sluggishness.

Poke root; Phytolacca (fluid extract). Horse, 2 dr. to 1 oz.; cow, $\frac{1}{2}$ to 2 oz.; sheep, 10 m. to 1 $\frac{1}{2}$ dr.; pig, 5 m. to 1 dr.; dog, 2 to 30 m. Especially useful in mammitis (garget).

Potassium; Potash. The caustic form is used to destroy warts and prevent growth of horns (p. 381).

Potassium chlorate. Horse, 1 to 2 dr.; cattle, 2 to 4 dr. For sore throat and sore mouth. As a gargle $\frac{1}{2}$ to 1 oz. in 1 pt. of water.

Potassium iodide. Horse, 1 to 2 dr.; cattle, 1 to 4 dr.; sheep, 15 to 30 gr.; pig, 10 to 20 gr.; dog, 1 to 10 gr. For paralysis, cure of lump jaw, goitre and dispersion of glandular swellings.

Potassium nitrate; Saltpeter. Horse, 2 to 4 dr.; cattle, 4 to 8 dr. For fever and acts on kidneys. In founder give 1 to 4 oz.

Potassium permanganate. Internally for poisoning by some plants; as an antiseptic and deodorizer use $\frac{1}{2}$ to 1 dr. to the pint or quart of water; as a uterine injection, use a $\frac{1}{2}$ to 1 solution.

Quinine sulphate. Horse, 15 gr. to 2 dr.; cattle, 30 gr. to 2 dr.; sheep, 20 gr. to 1 dr.; dog, $\frac{1}{2}$ to 5 gr. Tonic during convalescence from weakening disease; also to break up chill in fever, and blood poisoning.

Salicylic acid and Salicylate of Soda. Horse, 2 to 6 dr.; cattle, $\frac{1}{2}$ to 1 oz.; sheep, 1 to 2 dr.; pig, 30 to 40 gr.; dog, 5 to 20 gr. For acute rheumatism, influenza and strangles; especially effective in wind colic and stomach bloating.

Salol. Horse, 2 to 4 dr.; dog, 2 to 30 gr.; other animals same as salicylic acid. Internal antiseptic in diarrhea; valuable in rheumatism, influenza, and strangles.

Salt; Chloride of soda. Besides being an article of food is a tonic, appetizer, preventive of worms, and in large doses, a purgative. *Normal Salt Solution* consists of about 50 gr. per pint or approximately 1 heaping tablespoonful per quart of freshly boiled water.

Santonin. Horse, 1 to 4 dr.; cattle, 2 to 6 dr.; adult dog, 1 to 3 gr.; puppies, $\frac{1}{2}$ to $\frac{1}{4}$ gr.; pig, 5 to 8 gr. per 100 pounds of body weight. Destroys worms.

Silver nitrate; Lunar caustic. Used full strength to destroy warts, cauterize ulcers and prevent growth of horns; in solution of 1 to 2 grains to 1 oz. distilled water, for use in eye disease.

Sodium bicarbonate; Baking soda. Horse, 2 dr. to 2 oz.; cattle, 1 to 4 oz.; sheep, $\frac{1}{2}$ to 2 dr.; pig, $\frac{1}{2}$ to 1 dr.; dog, 10 gr. to $\frac{1}{2}$ dr. Use for indigestion but not for wind colic. Give 4 oz. doses every 4 hours for azoturia and $\frac{1}{2}$ oz. in 1 pt. of water for itchininess of skin.

Sodium hyposulphite. Horse, in wind colic, 2 to 4 oz. first dose; $\frac{1}{2}$ to 1 oz. later doses; cattle take 1 to 4 oz.; sheep and pig, 1 to 2 dr.; dog, 5 to 30 gr. For indigestion and as a wash for cleansing skin and vagina.

Sodium sulphate. See Glauber Salts.

Stavesacre seeds. Use 1 oz. crushed seeds steeped in 1 qt. boiling water to destroy lice. Larkspur seeds are a fair substitute.

Strychnin sulphate (alkaloid of nux vomica; dangerous poison). Given with hypodermic syringe by veterinarians as a nerve tonic in paralysis, etc. Horse, $\frac{1}{4}$ to 1 gr.; cattle, $\frac{1}{2}$ to 2 gr.; sheep, $\frac{1}{2}$ to $\frac{1}{4}$ gr.

Sulphur; Sublimed sulphur or Flowers of sulphur. As a laxative: horse, 1 to 4 oz.; cattle, 3 to 6 oz.; sheep and pig, $\frac{1}{2}$ to 1 oz.; dog, $\frac{1}{2}$ dr. to $\frac{1}{2}$ oz. Used also to destroy worms and external parasites.

Sulphuric acid, dilute (10 per cent solution). Horse, 1 to 4 dr.; cattle, $\frac{1}{2}$ to 2 oz.; sheep, 1 to 2 dr.; pig, $\frac{1}{2}$ to 1 dr.; dog, 3 to 30 m. Acid tonic and appetizer; for diarrhea and dysentery. In cattle, for bloody milk and externally for warts, ulcers, and malignant growths.

Tannic acid (astringent). Inject $\frac{1}{2}$ oz. to 1 qt. water to destroy pin worms; 1 dr. to the pt. in catarrh; and 1 to 2 ounces per pint of water to toughen shoulders and for galls, etc.

Tar, Oil of. Used in cough mixtures, but is most useful in ointment and lotions for skin disease and to destroy parasites. *Pine tar* also is given for cough; poured on a hot shovel to "smoke the head" in bronchitis and cold, and applied to wounds of the skin in sheep, to the horses' hoofs, to destroy warts, to keep maggot flies away, and to puffed joints in foals.

Tartar emetic. Largely used to destroy round worms of horses, rarely for other animals. Dose: 1 to 2 dr. in feed once or twice daily for 4 to 6 days.

Turpentine, Oil of. Horse (to kill worms) 1 to 2 oz.; cattle (for bloating) 2 to 4 oz.; given in 8 or 10 times its bulk of raw linseed oil, cottonseed oil, milk, or gruel. Much used externally in liniments.

Witch hazel; Hamamelis (extract). Useful for piles and as a lotion for sprains.

Zinc sulphate (astringent). For wounds, 1 oz. in 1 qt. of water, and in "White Lotion" (p. 373) and in eye disease, $\frac{1}{2}$ to 1 dr. per pt. of water. *Zinc Chloride* is caustic and used in foot rot, for fungous growths and for fistula at the rate of 2 dr. to 2 oz. per pint of water. The *Oxide* (powder) is used in ointments and for dusting on wounds.

Prescriptions

Absorbent liniment: Tincture of iodine, 5 oz.; chloroform, $\frac{1}{2}$ oz.; alcohol to make 1 pt. Apply twice daily.

Absorbing ointment: Iodine and iodide of potash, of each $\frac{1}{2}$ dr.; lard 1 oz. Rub in once or twice a day.

Anodyne (pain-easing) liniment: Tincture of aconite, 4 oz.; fluid extract of belladonna, 4 oz.; soap liniment (druggists'), 4 oz.; alcohol, 4 oz. Apply 3 or 4 times daily.

Bismuth paste: Bismuth subnitrate, 6 parts; white wax, 1 part; vaseline, 12 parts; soft paraffin, 1 part. Boil; mix well; place in Mason jar and keep tightly covered. To use, melt and inject with glass or metal syringe, adding more every 3 or 4 days.

Blister, I.: Powdered cantharides, 2 dr.; biniodide of mercury, 2 dr.; lard, 3 oz.; Mix. Clip off the hair; brush skin clean; rub blister in, a little at a time, for 10 to 15 minutes; tie horse to prevent it licking or biting the blistered part. Wash off in 48 hours. Then apply a little lard daily. Do not blister top of back, loins or croup, skin wet or irritated by liniment, or soon after applying a poultice.

Blister, II. (absorbent): Biniodide of mercury, 1 dr.; lard, lanolin, or vaseline, 1 oz. Mix; rub in for 15 minutes; do not wash off, but apply a little lard in 48 hours, then once daily.

Blister, III. (liquid): Cantharides, powdered, 2 dr.; turpentine, 4 oz.; cottonseed oil, 4 oz. Mix and heat in a double boiler or other "water jacket" vessel. Shake and rub well into skin; dilute one half with oil for less severe blistering.

Colic drench (flatulent or "wind colic"): Aromatic spirits of ammonia, 1 oz.; fluid extract of cannabis indica, $\frac{1}{2}$ oz.; salicylic acid, 2 dr.; nux vomica, 1 dr.; tincture of ginger, $\frac{1}{2}$ oz. Mix in 1 pt. of water and give as one dose. Repeat in $\frac{1}{2}$ of an hour, if necessary.

Colic drench (spasmodic colic): Chloral hydrate, 3 dr.; fluid extract of belladonna, 1 $\frac{1}{2}$ dr.; sulphuric ether, 1 oz.; water, 8 oz. Give as one dose. Repeat in $\frac{1}{2}$ hour, if needed.

Colic mixture (spasmodic colic or "cramp"): Sulphuric ether, 1 oz.; laudanum, 4 oz.; aromatic spirits of ammonia, 3 oz.; tincture of ginger, 4 oz.; water to make 1 pt. Dose: 2 to 3 ounces in $\frac{1}{2}$ pint warm water. Repeat in $\frac{1}{2}$ to 1 hour, and again as required.

Condition powders (horse or cow): Sulphate of iron, dried, 2 parts, *by weight*; gentian root, powdered, 2 parts; saltpeter, powdered, 2 parts; nux vomica, powdered, 1 part; ginger root, powdered, 1 part; fenugreek, powdered, 1 part. Mix. Give in dampened feed night and morning from a teaspoonful to a tablespoonful according to age and size of animal.

Cough mixture, Spirits of nitrous ether, 2 $\frac{1}{2}$ oz.; chloride of ammonia, 1 oz.; belladonna

leaves, fluid extract, 3 dr.; licorice, fluid extract, 3 oz.; water enough to make 1 pint. Dose: two ounces every 4 hours.

Diarrhea mixture, I. (calf): Bicarbonate of soda, 2 oz.; magnesia, 2 oz.; rhubarb, powdered, 1 oz.; ginger root, powdered, 1 oz.; cinnamon, powdered, 1 oz. Mix. Give 1 teaspoonful at night, or, in severe cases, 2 or 3 times daily.

Diarrhea mixture, II. (calf and foal): Prepared chalk, 4 parts; catechu, powdered, 1 part; bicarbonate of soda, 2 parts; ginger root, powdered, 1 part; rhubarb, powdered, $\frac{1}{2}$ part. Mix. After a preliminary dose of castor oil in milk, give 1 to 2 teaspoonfuls 3 times a day, shaken up in gruel.

Diarrhea mixture, III. (sheep and lambs): Prepared chalk, 1 oz.; laudanum, 4 oz.; tincture of ginger, 1 oz.; peppermint water, 8



FIG. 428. Drenching a sheep. See page 365

oz. Mix; shake well. Dose: sheep, 2 to 3 tablespoonfuls, night and morning; young lambs, $\frac{1}{2}$ to $\frac{1}{3}$ of this.

Dip, I. (lime and sulphur): Unslaked lime, 8 lbs.; flowers of sulphur, 25 lbs.; water, 100 gallons. Slake the lime to a thin paste in a shallow box, then sift in the sulphur and mix to a mortar-like paste, adding water as required; place in 30 gallons of boiling water and boil and stir with large hoe for at least 2 hours (adding water to keep the 30 gallons) until the sulphur disappears from the surface and the liquid is of a chocolate or dark amber color. Allow liquid to stand in a large barrel or tank until all sediment has settled; then draw off clear liquid and add warm water to make 100 gallons of concentrated dip. To use, add 70 gallons of warm water to 30 gallons of this concentrate.

Dip, II. (nicotine for sheep): Nicotine, $\frac{1}{4}$ lb.; sulphur, 16 lbs.; water, 96 gals. Mix nicotine and sulphur with warm water and stir well; add the rest of the water in the dipping vat. From time to time add more water to replace what evaporates.

Dip, III. (tobacco for sheep): Tobacco, 30 lbs.; sulphur, 7 lbs.; concentrated lye, 3 lbs.;

water, 100 gals. Steep tobacco in hot water for 24 hours; strain; add the sulphur, lye, and water to the tobacco solution to make 100 gallons. Use the dip warm and keep it well stirred.

Drying or dusting powder: 1 oz. each of: Alum, dried; copper sulphate, powdered; iron sulphate, dried; boric acid and calomel. Wood charcoal, powdered, 2 dr. Mix. Apply twice daily to wound that tends to form "proud flesh."

Dusting powder (cheap): Equal quantities of: Slaked lime, sulphur, naphthalin and charcoal. Mix. Apply 2 or 3 times daily.

Electuary (sweet, syrupy paste): Gum camphor, 1 oz.; fluid extract of belladonna leaves, 1 oz.; gentian root powdered, 1 oz.; licorice root, powdered, 5 oz.; molasses or honey, to give desired consistency. Powder the camphor with alcohol in mortar; add the other drugs, mixing to form a mass that will lift on a wooden paddle. Dose: 1 teaspoonful to 1 tablespoonful every 3, 4, or 6 hours, according to age and size of animal, and severity of attack.

Fever mixture, I.: Fluid extract of belladonna, 2 dr.; fluid extract of gentian, 1½ oz.; saltpeter, powdered, 1 oz.; water, 1 pt. Mix. When ready to give dose add 1 to 2 teaspoonfuls of sweet spirits of nitre. Dose: 2 ounces given (with strong, short-barrelled, hard-rubber syringe) every 3, 4, or 6 hours, according as animal's temperature is either 102 to 3, 103 to 4, or 104 to 6.

Fever mixture, II. (for bronchitis and pneumonia): Fluid extract of belladonna, 3 dr.; fluid extract of gentian, 2 oz.; saltpeter, powdered, 1 oz.; chlorid of ammonia, powdered, 1 oz.; water, 1 pt. Add sweet spirits of nitre and give as directed for Mixture No I. Used in pneumonia and bronchitis.

Fly repellants. For *Horn Fly*, (1) kerosene, ½ pt. Rancid lard, 1 lb. Mix thoroughly. Rub on back with cloth or hand. (2) Kerosene, 1 part; fish oil, 2 parts. Mix and spray over cattle. (3) Kerosene emulsion: Boil ½ lb. shaved hard soap in 1 gal. water; take from stove and while boiling hot add slowly 2 gallons cheap kerosene, churning mixture vigorously or forcing it through a spray pump until a creamy emulsion results. To use dilute with 6 to 8 times as much water, by measure.

For *Horse Fly* and *Bot Fly*: Pine tar, 1 gal., kerosene, fish oil, or crude carbolic acid, 1 qt., flowers of sulphur, 2 lbs.

For *Ox Warble Fly*: (1) Dissolve ½ lb. hard soap in 1 gal. boiling water; add slowly 2 gals. fish oil churning or forcing through pump for several minutes. To use, add 15 to 20 parts of water to 1 part of this stock, mixing thoroughly. (2) Sulphur, 4 oz. Spirits of tar, 1 gill. Whale oil, 1 qt. Mix. Apply once a week.

Healing or "gall" ointment: Tannic acid, 1 dr.; iodoform, 1 dr.; boric acid, 1 dr.; lard, 1 oz. Mix. Apply twice daily.

Healing powder, I. Equal quantities of:

Zinc oxide, boric acid, calomel, and subnitrate of bismuth. Mix. Apply 2 or 3 times daily.

Healing powder, II. Iodoform, 1 dr.; calomel, 1 dr.; subnitrate of bismuth, 1 dr.; boric acid, 5 dr.; Mix. Dust on sores to keep off flies and promote healing.

Heave powders: Arsenious acid, 2 dr.; nux vomica, powdered, 2½ oz.; gentian, powdered, 3½ oz.; ginger, powdered, 2 oz.; charcoal, powdered, 3 oz.; Mix and divide into 60 powders. Give 1 night and morning.

Purgative ball (horse): Barbadoes aloes (fresh powder), 1 oz.; fluid extract of belladonna, 1 dr.; ginger, powdered, 2 dr.; licorice powder to form desired mass. Mix in a mortar; form into a cylindrical "pill" and wrap in tissue paper, or give in gelatine capsules. Prepare horse by feeding 2 bran mashies, without hay, before dosing; then allow lukewarm water sparingly and hay until purging ceases.

Quittor injection caustic: Corrosive sublimate, 1 oz.; hydrochloric acid (dilute) 2 oz. Inject once a week, or oftener if advised by veterinarian.

Refrigerant lotion, I. Saltpeter, powdered, 1 oz.; chloride of ammonia, 1 oz.; water, 1 pt. A cold lotion for inflamed swellings, sprains, enlarged joints, etc.

Refrigerant lotion, II. Saltpeter, 1 oz.; common salt, 1 oz.; vinegar, 1 pt.; cold water, 1 pt. Dissolve saltpeter and salt in the water; add the vinegar; shake well and apply a little to affected parts.

Scratches ointment: Spirits of camphor, 1 dr.; comp. tincture of benzoin, 1 dr.; sulphur, 2 dr.; lard, 1 oz. Mix. Apply 3 times daily.

Tonic: Quinine sulphate, 2 dr.; tincture of chloride of iron, 1½ oz.; water, to make 1 pt. Give 2 ounces in a little water or thin gruel night and morning.

Tonic powders, I. Quinine sulphate, 4 dr.; sulphate of iron (dried), 1 oz.; gentian root, powdered, 3 oz.; nux vomica, powdered, 1 oz.; saltpeter, powdered, 1½ oz. Mix and divide into 12 powders. Give 1 powder 2 or 3 times daily as required.

Tonic powders, II. (for sheep). Iron sulphate, dried, 1 oz.; nux vomica, powdered, 6 dr.; gentian root, powdered, 4 oz.; licorice root, powdered, 4 oz.; saltpeter, powdered, 4 dr.; charcoal, powdered, 4 oz.; flaxseed meal, 4 oz. Mix; give tablespoonful twice daily in feed.

Tonic and indigestion powder (horse or cow): Bicarbonate of soda, 4 parts; nux vomica, powdered, 1 part; gentian root, powdered, 2 parts; ginger root, powdered, 1 part; charcoal, powdered, 3 parts; fenugreek, powdered, 1 part. Mix. Give 1 teaspoonful to 1 tablespoonful in feed 2 or 3 times daily, according to age and size of animal and severity of case.

White liniment: Turpentine, 1 oz.; Ammonia, liquid, 1 oz.; raw fresh egg, 1; water, soft, 1 pt.; break egg in water and shake up now and then for 24 hours; then add turpen-

tine and ammonia; set mixture in the sun and shake often until a creamy white emulsion is formed. Use for sprains, strains, thickened tendons, enlarged joints, wasted muscles, chill, sore throat, pleurisy, pneumonia, etc.

White lotion: Lead acetate (sugar of lead) 1 oz.; zinc sulphate, 6 dr.; water, 1 pt. Label the bottle "poison"; shake well before using. Apply 3 times daily to barb wire cuts and other shallow wounds.

Whitewash (Government formula): Slake $\frac{1}{2}$ bu. quick lime in hot water; cover to keep in steam; strain through fine sieve or strainer; add 1 peck salt dissolved in hot water, 3 lbs. ground rice boiled to thin paste, and stir in boiling hot $\frac{1}{2}$ lb. powdered Spanish whiting

and 1 lb. glue previously dissolved over a slow fire; add 5 gallons hot water to mixture, stir well and let stand covered for a few days. Apply hot with small brushes. One pint of mixture will cover a square yard; can be colored to suit.

Yeast mixture: Stir one cake of compressed yeast to a paste with a little warm water and let stand for 12 hours in a moderately warm room; stir in 1 pt. warm water and let stand for 12 hours more; then strain through cheese cloth and, with a syringe, inject it into the vagina after cleansing that passage with warm water. Breed an hour after giving the injection. This treatment is worth trying in barrenness, but is not a certain remedy.

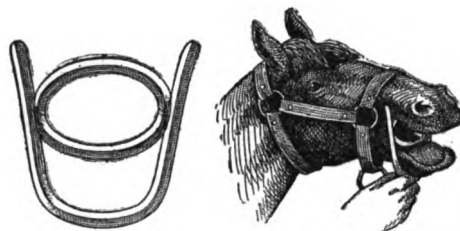


FIG. 429. A balling iron and sketch to show how it is placed in an animal's mouth to prevent injury to the hand in giving certain medicines or examining the throat.

CHAPTER 33

The Surgical Treatment of Farm Animals

By DR. A. S. ALEXANDER. (See Chapter 26). *No one knows better than an experienced surgeon how essential it is to perform even the smallest operation with the most scrupulous care and accuracy. It is needless to say, therefore, that in telling farmers just what to do in such emergencies as may confront them, Dr. Alexander has told them also the very best and safest way in which to do it.*—EDITOR.

SUCCESS in caring for sick or injured animals demands first, a knowledge of the treatment needed and how to give it; second, prompt action as soon as the trouble is discovered and recognized; and third, the utmost attention to details in carrying out the required program. In some cases the necessary treatment, at least the first treatment, is beyond the ability of the farmer. When such is the case a competent veterinarian should be summoned at once provided, of course, that the value of the sick animal warrants the expense of such expert services. Until this assistance arrives give such "first aid" treatment as advised under the discussion of the trouble in question in the preceding chapters.

Many times, however, merely the giving of medicine or a slight operation is called for; in such cases the farmer can easily do the work if only he knows just what steps and precautions are needed. This chapter describes the tasks that any farmer may have to perform and such attention as he may have to render at almost any time; and also a few more difficult operations which, when called for, are very badly needed, so that if a surgeon cannot be obtained the farmer may step into the breach and feel that he has at least done everything possible. Oftentimes, too, prompt action, even if unskilled, brings a better chance of success than expert care too long delayed.



FIG. 430. When an artery is cut as at *a* apply the tourniquet between the wound and the heart as at *b*.

The material that follows is divided roughly under three heads: (1) general instructions on the Care of Wounds (pp. 375 and 376); (2) detailed directions for those common operations that every stockman expects to perform from time to time and for which he can make careful preparation (pp. 376 to 383); and (3) emergency treatments and operations which are resorted to only when other methods fail or when a crisis is at hand (pp. 383 to 388.) Undoubtedly the most important of all points to be kept in mind by the farmer-surgeon is the value of cleanliness, *surgical* cleanliness, in handling wounds, diseased surfaces, internal parts, etc. This means freedom not only from visible dirt, but also from invisible germs and poisons. These can be removed, destroyed, or kept away only by the use of reliable, proved materials such as iodine, coal tar disinfectants, etc. Let every farmer learn once and for all how to prevent infection. The knowledge will protect himself as well as his live stock, for the germs that cause abscesses and blood poisoning attack man as readily as they attack animals.—EDITOR.

Index of Operations

Abscess, Opening an, p. 385
 Castration of, colts, p. 378
 boars, p. 380
 bulls, p. 379
 lambs and rams, p. 379
 ridglings, p. 380
 ruptured animals, p. 380
 Catheter, Passing the, p. 386
 Dehorning, p. 381
 Dentistry, p. 382
 Docking and Nicking, p. 382
 Firing, p. 383
 Gullet, Opening the, p. 385
 Injections, How to give, p. 366

Medicine, How to give, pp. 161, 365
 Parturition, Help at, p. 383
 Paunch, Opening the, p. 385
 Plaster casts, How to apply, p. 366
 Poultices, How to apply, p. 366
 Restrain animals, How to, p. 376
 Ringing the bull, p. 383
 Spaying the cow, p. 381
 mare, p. 380
 sow, p. 381
 Stomach tube, Passing the, p. 386
 Tapping, p. 387
 Trephining, p. 388
 Unnerving, p. 388
 Windpipe, Opening the, 385
 Wounds, How to sew up, p. 376

How to Treat Wounds

Treat every wound immediately. Delay may result in lockjaw, blood poisoning or unnecessary formation of pus, causing unsightly scars. Successful treatment depends on: stopping the blood flow; removing all dirt, hair, straw, shreds of skin, bits of bone, blood clots or other foreign or irritating bodies; disinfecting to kill germs; letting the part rest; and keeping the wound clean while healing.

First find out just how bad the wound is. If it includes broken bones or injured vital organs, send for a veterinarian, meanwhile following the directions below as far as possible. If a simple flesh wound—

1. Stop the blood flow. If the blood is bright red and comes in jets it is from an artery. Apply, if possible, a very tight bandage above the wound (between it and the heart). A stick thrust under the bandage or through the knot and twisted makes what is called a tourniquet (tur-ni-kay) and quickly gives the necessary pressure. Find and grasp with forceps the end of the artery coming from the heart, tie a piece of suture silk tightly around it, and bind a layer of absorbent cotton soaked in a 1-1000 solution of bichloride of mercury, or other disinfectant upon the wound. When the bleeding stops the wound can be sewn up (see below) if thought advisable.

If the blood is dark red or purplish and flows or drips steadily, it is from a vein and can be stopped by irrigating (douching) with very hot or very cold water followed by pads of absorbent cotton or gauze saturated with disinfectant and bound on fairly tight. A cherry red hot iron is sometimes used to sear the wound and stop this kind of bleeding. If the blood flows very freely, put on a tourniquet below the wound (the side away from the heart).

2. Clip all hair from about the wound and cleanse it thoroughly removing *all* dirt, etc.

3. Bathe and flush out with a hot 1-1000 solution of bichloride of mercury, a 2 per cent permanganate of potash solution, or a 1-100 coal tar disinfectant solution.

4. Apply tincture of iodine to skin around the wound and to the wound itself if shallow.

5. Insert in the cavity (if deep)

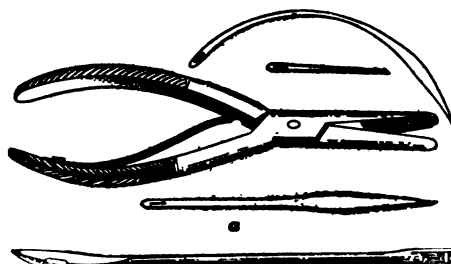


FIG. 431. The upper four implements are 3 forms of needle for sewing up wounds and a forceps for holding them. Below (a) is a seton needle (p. 307).

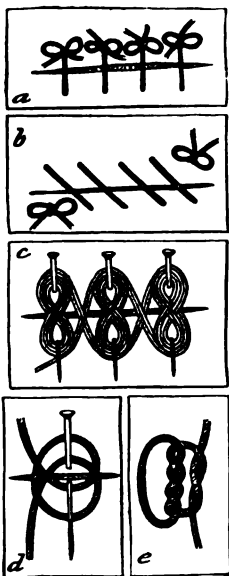


FIG. 432. Stitches used in surgery. *a* interrupted suture; *b* uninterrupted suture; *c* twisted suture using pins and silk; *d* single pin suture for small wounds; *e* surgeon's knot properly tied. (Diseases of Cattle.)

"drains" of small rubber tubing, antiseptic gauze or teased oakum to carry out pus.

6. If wound is so deep that its lips gape widely sew it up (*suture* it) thus: (a) Use a sterilized curved needle and needle holder and special veterinary suture silk freshly dipped in a disinfectant. (b) Take stitches from one fourth to one inch apart according to the size and depth of the wound. (c) Always start a stitch in sound skin well back of one lip of the wound and bring it out well beyond the other. The most common stitch is the "interrupted suture" (Fig. 432). (d) When the silk has been passed through both lips of the wound, cut it off leaving ends long enough to tie, and make the next stitch. (e) When all stitches are in place, tie the ends of each in turn with a surgeon's knot (Fig. 432) and bow knot, until the wound is tightly closed. (f) Dust the wound with healing powder (p. 372) renewing this daily. In deep wounds requiring drains (see 5 p. 375), a liquid antiseptic may be used daily as well as the powder. (g) Stitches can usually be removed in 7 to 10 days.

In shallow wounds very prompt union of the lips may occur ("healing by first intention"); otherwise new scar tissue gradually fills up the cavity. If because of lack of pressure, too much of this tissue forms and sticks out of the wound, it is called "proud flesh" and should be controlled by pressure from a compress and bandage and if necessary, by applying a mixture of equal quantities of powdered sulphate of copper, alum, and tannic acid.

Barb wire wounds. If deep but not torn across muscles, these may be sewed. If not bad enough for this, treat frequently with "white lotion" (p. 373.)

Punctured wounds. Take special care to remove every bit of foreign matter, splinters, etc. Anything left in the wound is likely to result in a chronic running (fistulous) sore. Irrigate thoroughly with a lukewarm 2 per cent solution of permanganate of potash or coal tar disinfectant, then pack with gauze or oakum (see abscess p. 385). A deep, fistulous, slow-healing wound may heal if filled with bismuth paste (p. 371).

How To Restrain Animals For Operations

Horses are restrained for operations by casting them with hobbles, side lines (Fig. 435) or other appliances, or they are placed upon the veterinary operating table (Fig. 457). Large cattle are thrown and tied in like manner, or as shown in Fig. 434, or are held in stanchions, stocks, or chutes. For such operations as spaying and docking, horses also are restrained in stocks. In using such apparatus care must be taken to prevent injury to the animal and to so restrict movements of its legs that accidents shall not happen to the operator or his assistants. Wherever possible, the animal should, for serious operations, be rendered insensible to pain by making it breathe chloroform or ether from an inhaler placed upon its



FIG. 433. Severe wire cuts healing satisfactorily

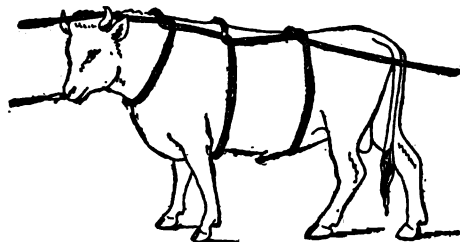


FIG. 434. One way to cast a bull or steer. The rope may be fastened around the horns or held by a second operator. Only a light pull is necessary.

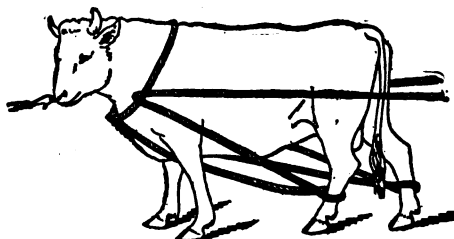


FIG. 435. Second method of casting large animals, with side lines. Various types of harness are made for this purpose. (This and Fig. 434 from Diseases of Cattle.)

muzzle; or $\frac{1}{2}$ to $1\frac{1}{2}$ ounce of chloral hydrate may be dissolved in water and given to an adult horse through mouth or rectum shortly before the operation. In some instances, however, it is necessary only to render insensible the part to be operated upon, by injecting a 2 to 5 per cent solution of cocaine or eucaine upon the nerves with a hypodermic syringe. This commonly is done when unnerving a horse.

To distract the attention of a horse during a slight operation, a twitch (Fig. 436) is placed upon its nose; a fore foot may also be held or tied up, or a hind one kept off the ground with a side line.

Castration and Spaying

The removal of the organs in which the germs of reproduction are produced (*testicles* in the male, *ovaries* in the female) is called, in the case of the male, *castration*, "altering" or "cutting" (in poultry *caponizing*), and in the case of the female *spaying*. The stallion when altered is called a gelding; the bull, a steer; the ram, a wether; the boar, a barrow; the rooster, a capon. Any mature animal when castrated may be called a "stag."

Castration of the young animal makes it (a) as a worker, more quiet and docile, (b) as a meat producer, more easily and quickly fattened, and (c) makes the meat more tender and tasty. It also prevents the development of the typical male appearance, and cows are sometimes spayed to lengthen their period of milk production. The operations are fairly safe if done expertly and with every precaution against infection and accident. Otherwise they are very dangerous.

General hints. (1) Operate only in fine, dry, clear weather in spring or fall when flies are not about. (2) Make large and mature animals unconscious by the use of ether or chloroform (p. 368) before operating. (3) To prevent infection by pus producing, or lock jaw germs, choose a clean place to work in, such as a sunny grassplot and not a manure heap, straw pile, or damp, dirty building. (4) If possible have a reputable, trained, experienced man do the work and never a "quack" or unknown, traveling operator. (For Caponizing, see Appendix.)

Castration of Colts

Castrate the colt when well grown and sufficiently masculine; not so early that the gelding will look effeminate, nor so late that he will be stallion-like, or "staggy," with crested neck, thick throat-latch, and heavy forehead (forequarters). Most colts are castrated at one year old. Put off the operation if the colt is affected with or recovering from strangles

(colt distemper), influenza, or any infectious disease, else death may occur. Do not operate in a place which has been occupied by diseased horses. While the standing operation is popular with some, it is best to cast the colt that there may be less danger to the animal, operator and helpers, and that the operation may be carefully and properly performed.

Directions. (1) Examine the scrotum to make sure that both testicles are there and no

rupture present. (2) Cast the colt and so tie his feet and legs that the joints will be kept bent. (3) Cleanse the scrotum and around it with soap, hot water and a stiff brush, rinse with a 2 per cent solution of carbolic acid or

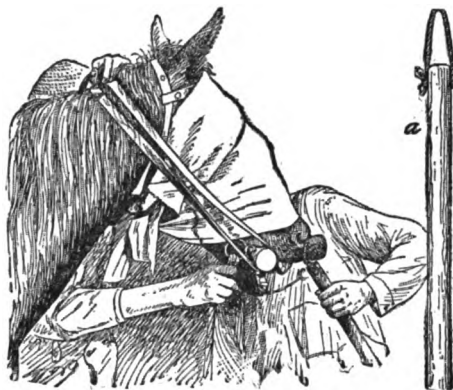


FIG. 436. Home-made twitch (a) and how to use it in holding a horse for a simple operation

coal tar disinfectant; then dry and paint scrotum with tincture of iodine. (4) Scrub the hands and finger nails clean with soap, hot water, and a stiff brush, rinse with alcohol, then with a 2 per cent disinfecting solution. (5) Hold the skin of the scrotum tight and with a sharp, sterilized knife cut through the skin and the envelopes of the testicles making a long, free incision to one side of and in the same direction as the middle line. (6) Make a similar incision to expose the other testicle. (7) Grasp and pull out the lower testicle. (8) Cut through the tendon part of the (cremaster) muscle at rear part of cord. (9) Apply a sterilized emasculator (Fig. 437) well up on the cord and with it very slowly crush through the tissues, holding it in place for a couple of minutes before removing it. (10) Remove the other testicle the same way. (11) Cut away all loose shreds and slit open any pocket in the scrotum that might catch and hold serum, blood, or pus. (12) Slowly and carefully remove the casting harness and let the colt rise. (13) Bathe the wound with cold water for a few minutes and keep the colt tied up until the blood ceases to drip. If the stallion is old or the weather very hot, place Ochsner hemostatic (bloodstopping) forceps upon the cord at 2 places above the part to be severed by the emasculator to prevent excessive bleeding.

The morning after the operation rip open the wound with perfectly cleansed and disinfected fingers freeing the ends of the cords if found sticking, then make the colt take active exercise daily in a clean grass field.

Swelling of the sheath after castration usually is due to infection and necessitates opening the wounds, disinfecting the parts

daily and giving ample exercise. If the swelling persist, lightly scarify (p. 289), the swollen parts and bathe with a warm disinfecting solution to encourage a flow of serum. If an abscess forms in the scrotum, let out the pus, inject a disinfecting solution and afterward keep the wound open.

Bleeding sometimes follows castration (usually in hot weather) but it is rare when the operation has been correctly performed. If it keeps up but is moderate, pack the scrotum with absorbent cotton saturated with a 2 per cent solution of coal tar disinfectant. Insert stitches to hold the cotton in place. Use strong alum solution if the bleeding is more profuse but *do not use* tincture of iron or Monsel's solution. If the bleeding is alarming, have a veterinarian pack the scrotum as advised, cast the colt, remove the cotton, and locate and tie the bleeding blood vessel.

Blood poisoning from infection sometimes follows castration; severe attacks commonly proving fatal. The colt has a high fever, fast, weak pulse, colicky pains and swollen scrotum. In such cases, have the veterinarian open and frequently disinfect the wounds and give quinine 2 or 3 times daily in one half- to one-dram doses according to the age and size of colt. If peritonitis has not yet set in, prompt treatment may succeed.

Lockjaw (p. 270) results from the immediate healing of the scrotal wounds so that they keep inside the germs of the disease which increase and produce poisons where air is lacking. Attacks are unlikely if disinfectants are used, cleanliness observed in operating, and the wounds kept open. Wherever lockjaw is common it is well to give a hypodermic injection of 10 cubic centimeters of tetanus antitoxin after castration, as a preventive against the disease.

Tumor of the cord (*scirrhous cord*) sometimes follows castration. The cut end of the cord becomes caught between and sticks to the healing lips of the wound which may be invaded by a fungus, a large growth resulting. Treat by casting the colt, dissecting the tumor and cord from all attachments, and then cutting the cord above the tumor. Bleeding often is profuse and dangerous and must be controlled as already advised (p. 375). To prevent this formation of tumors make the

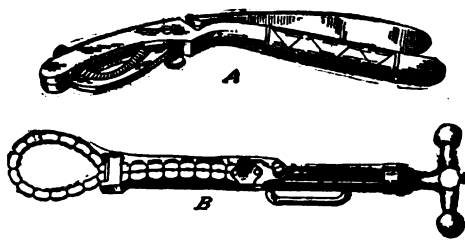


FIG. 437. Castrating instruments: a emasculator; b scissor

cuts in the scrotum large and in such a position as to insure drainage, and cut the cords high above the testicles.

Water seed (*hydrocele*) is a collection of serum in the scrotum. In castrated animals the fluid is let out by cutting into the lowest part of the scrotum after which a 2-per cent solution of carbolic acid or coal tar disinfectant is applied daily until the wound heals; or the fluid may be drawn off by means of an aspirator.

Castration of Bulls

The general directions for castrating and after-treating stallions should be followed. While cattle are less likely to become infected than horses, equal care as to cleanliness and disinfection should be taken. If possible castrate just as soon as the calf is thriving well and the testicles have become sufficiently prominent. Delay increases danger and difficulty.

The small calf may be castrated standing; cast and tie the larger ones. Use casting hobbles on old bulls, or tie the animal in stocks. On the range the calf's hind and fore legs are separately lassoed and the animal thrown and stretched "fore and aft."

The writer's plan of securing and castrating fairly large calves (Fig. 438) is as follows: Have an assistant back into a corner; set the calf on its rump, legs outward, and hold it by the fore-legs; double a 2-yard length of rope and tie the loose ends together; place one loop of the rope over the calf's right hind foot, twist the ropes and place the other loop over the left

hind foot; stand on the rope with the left foot against the calf's right foot and the right foot against the calf's left foot to spread the legs apart and prevent kicking; stoop down

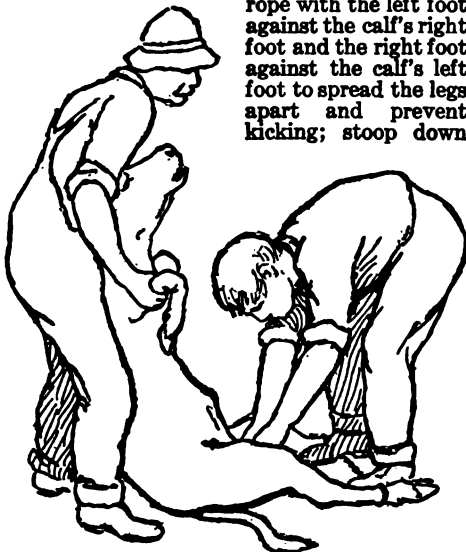


FIG. 438. Dr. Alexander's method of holding and castrating large calves

and operate as follows: (1) Either cut off a portion of the end of the scrotum to expose both testicles, or make a separate incision over each testicle, as in castrating a colt. (2) Pull out each testicle in turn. (3) Cut the cremaster muscle. (4) Scrape through the cord if the calf is small, or sever it with an *écraseur* if he is large.

By making the cuts upon the inner front surface of the scrotum the "purse" or "cod" is left plump, unscarred and outwardly smooth, all desirable features in a fat steer. Cutting off the end of the scrotum leaves a more wrinkled purse. Castrate an old bull by the method advised for old stallions.

Castration of Lambs and Rams

Castrate the lamb when 2 to 6 weeks old; the earlier the better if it is well grown and in good health. The lamb is easily handled but see that hands and instruments are clean and disinfected. An assistant lifts it and with each hand holds a fore and hind leg firmly while pressing the animal's back against his chest or knee (Fig. 440). The operator then cuts off a portion of the lower end of the scrotum, blows back the wool and pulls upon each testicle in turn until the cord stretches and breaks. Some shepherds do this with their teeth. The cord should be scraped through well above the testicle if the lamb is much over 2 weeks old. The well-grown or old ram is cast and tied, or securely held, and castrated like a stallion, by means of Ochsner forceps and an emasculator (Fig. 437).

Castration of Boars

Operate when the animal is quite young, as old hogs do not well withstand shock and loss of blood. Take all precautions regarding cleanliness and disinfection as outlined above, and be especially sure that the cuts in the scrotum are large and placed so well forward between the hind legs that drainage will be perfect. If small cuts are made and the cords severed close to the testicles, scirrhus cords (p. 378) are liable to result. These are very common in pigs, which often die from shock or bleeding following an operation for the removal of the tumor. Some treat this trouble in pigs by cutting into the centre of the tumor, inserting a No. 10 gelatine capsule filled with concentrated lye or other caustic, and keeping it in place by packing in cotton. This causes sloughing, after which healing may follow.

A good way to hold a small pig is to set it upon its back in a small, clean feeding trough, then tightly hold its feet together; large hogs should be cast and tied.

Operate on old boars as advised for colts (p. 378). In young boars the testicles after being exposed by making a free incision and cutting the cremaster muscles, are pulled out

as far as possible and the cords scraped through, or crushed off with an emasculator or *écraseur*. In small pigs the cord may be scraped and then pulled out and broken off by a sudden jerk. After the operation turn the animal into a clean grass field. If any swelling or stiffness is noticed, open and thoroughly disinfect the wounds.

Castration of Ruptured Animals

The descent of the bowel into the scrotum (*scrotal hernia*) is frequently met with in the colt. In most cases recovery takes place without treatment during the first year of life. If it does not, have a skilled veterinarian operate by the "covered" method.

This trouble also is common in the pig but does not there tend to disappear without treatment. The expert operates by carefully cutting through the skin and other tissues over the bowel which he then works through the inner abdominal ring up into the abdominal cavity where it belongs. He next pulls up and removes the testicle, and closes the abdominal opening with stitches of silk.

Castration of Ridglings

The testicles usually descend into the scrotum before the colt is 6 months old. If both are retained in the abdominal cavity the horse is termed a *cryptorchid* and is usually sterile; if one is retained, he is *monorchid* and may be potent. Both types are commonly called "ridglings" and should be castrated. In some cases one testicle or both may descend but part way; the animal then is termed a "high-flanker" and may beget colts. Tendency to the ridgling condition in all animals is considered hereditary hence the advisability of always castrating those showing it.

The castration of a ridgling requires a trained, experienced veterinarian and is al-

most certain to prove fatal if attempted by a bungler or performed without taking every precaution against accident and infection.

The undescended testicles of the bull and boar are removed through an opening made high in the flank, as in spaying a cow (below), the animal being kept under the effect of an anesthetic during the operation. The ridgling condition is rare in the ram.

Spaying

Spaying the mare. This difficult and somewhat dangerous operation, to be undertaken by only the experienced surgeon, usually is done to prevent persistent heat periods, viciousness, kicking, and tail-switching. Secure the mare in stocks and render her partially unconscious by a rectal injection of chloral hydrate in water. Sterilize the hands and instruments as for the ridgling operation, cleanse and distend the vagina by injecting a lukewarm antiseptic solution and operate through that passage. Make a small cut an inch or two above and to the side of the neck of the womb, and enlarge it until the hand can be introduced into the abdominal cavity. Locate the horn of the womb, follow it until an ovary is found, pull it outward and remove it with a spaying *écraseur* held in the free hand. Locate and remove the other ovary and withdraw the two ovaries, *écraseur* and hand together. The wound does not require stitching and should heal quickly if not infected during the operation.

Spaying the cow. This operation should also be performed only by an expert with due precautions to prevent accident and infection. While the ovaries may be removed through an opening in the wall of the vagina, the flank operation is most popular, the animal being thrown or secured in stocks or a chute. The opening is made high up in the left flank, if the animal is young; in the right flank if it is



FIG. 439. Castrating a young pig: left how to hold it; centre making the incision; right scraping the cord. (Farmers' Bulletin 780).

old. Clip the hair from the seat of the operation, wash the skin clean, disinfect and paint with tincture of iodine. Make an incision about 4 inches long from above downward through the skin at a point equi-distant from the last rib, spine and hip bone. Cut and tear with the fingers through the muscles and wall of the abdomen until the left hand, perfectly cleansed and disinfected, can be introduced. Then locate each of the ovaries in turn by finding the womb and following its horns to their ends, and crush them off by means of a special *écraseur* (or long-handled curved shears in the case of a young heifer). After withdrawing the instrument, ovaries, and hand, stitch the skin wound closed, dust with iodoform and cover with pine tar.

Spaying the sow. Improved hogs now mature and are marketed so young that spaying is not commonly done. The ovaries are removed through an opening cut in the upper left or right flank. Place the sow on her side, and after the seat of operation has been shaved, scrubbed clean and disinfected, make an incision through the skin and then through the underlying tissues at a point equi-distant from the last rib, spine and point of the hip, as in spaying the cow. Pass the fingers into the abdominal cavity, locate the womb and follow its horns until the ovaries are found, pull them to the opening, one at a time, and remove them by means of a canine (dog) emasculator. Keep artery forceps on the stumps of the ovaries until bleeding subsides; after removing them sew the skin wound closed, removing the stitches in 10 days.

Dehorning

Cattle are dehorned to prevent them goring, to make them more docile and so they may stand closer together in shipping cars and at feeding troughs. Small horns are readily cut off with dehorning shears (Fig. 445) and large ones with a fine meat saw (Fig. 444). Some operators prefer to use the shears for both young and old cattle. The saw possibly causes



FIG. 440. Method of holding a lamb for castrating with emasculator. (Can. Dept. of Agr. Pamphlet 9).

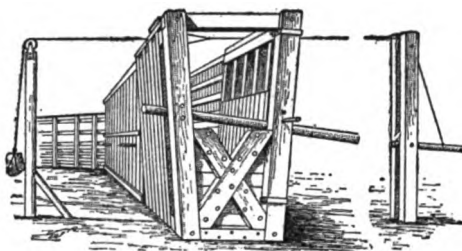


FIG. 441. A chute and stocks used on the range in dehorning and ringing animals. One side is hinged at the bottom and kept open by a weight until the animal is in place with its head under the bar. Then the lever at the right is forced down, pulling the hinged side over and holding the animal firmly.

most pain. Whichever instrument is used, it should be sharp and perfectly clean.

Where many animals are handled, each is held for the operation in a special chute or stocks but with a few the work can be done with the animal snubbed up to a post, secured in a stanchion or cast with ropes. Dehorning should be done in fine, dry weather, in spring or fall, when flies are absent.

Remove the horn *close to the skull* together with a collar of hair. If bleeding is troublesome, saturate cotton batting or oakum in a solution of 2 teaspoonfuls of coal tar disinfectant to the pint of hot water and bind it upon the wound. Cut the bandage in 15 hours and let the cotton drop off when loose. Keep the animal's head high. Profuse bleeding may also be stopped by allowing a stream of very hot water to flow over the wounds for 15 minutes after which cotton and a bandage may be applied if thought necessary. Pine tar is a favorite application for dehorning wounds.

The wounds should be cleansed and disinfected a day or two after the operation. If pus continues to flow, horn particles or other foreign bodies have lodged in the cavity at the base of the horn. In such a case flush the cavity out with a warm 2-per cent solution of permanganate of potash daily until recovery. If a horn stub is present, saw it off close to the skull before giving other treatment.

Chemical dehorning. To prevent the growth of horns, treat calves when not more than 1 week old with caustic potash or caustic soda as follows: (1) Smear lard or vaseline on the skin around but not over the horn buttons. (2) Dampen the skin over the buttons. (3) Rub the stick of caustic upon the dampened skin over each button until a crust begins to form. (Put on an old glove or wrap one end of the caustic stick with heavy paper to protect the fingers.) (4) Keep the calves out of the rain for several days.

Horn stubs of a calf 1 or 3 weeks old may be cut out with a knife or removed with a special instrument, but such an operation should be avoided whenever possible.



FIG. 442. In dehorning cut close to the head, removing a ring of hide as at a.

Dentistry

In chewing, the grinding (*molar*) teeth of the horse do not entirely cross one another, so that in time sharp points of enamel are left unworn on the upper molars next the cheeks and on the lower ones next the tongue, which tend to wound the cheeks or tongue and make chewing painful and imperfect.

They should therefore be filed down at least once a year with a rasp, or "float" (Fig. 443). The veterinary dentist also uses "closed" cutters to remove larger points, "open" cutters to cut off projecting molars, and small or large forceps to extract splinters, split molars or entire diseased ones; molars are also removed by trephining (p. 387). "Wolf teeth" are extracted with special forceps, when they interfere with the bit of the overhead check, but need not be removed on account of the eyes as they never cause weakness or disease of those organs. The



FIG. 443. A good float for the farmer's use

"crowns" or "shells" of milk teeth often stick to the incoming permanent teeth, or lodge between them, or cut the cheeks or tongue, causing imperfect and painful chewing of feed and consequent ill-thrift of the young animal. They should be removed by means of special forceps. These operations are necessary in cattle and sometimes in sheep as well as in horses. Timely attention to the teeth saves feed, increases ability to work or produce, and prevents suffering.

Lampas or lampers is not a disease but merely a swollen condition of the bars of the hard palate just behind the upper incisor teeth (nippers) of the horse, commonly associated with similar swelling of the gums, due to cutting or irregularity of the teeth. Intelligent dentistry, daily rubbing of the swelling with a block of alum and the feeding of old hard ear corn usually end the trouble promptly. Cutting or burning of the swollen parts is unnecessary and cruel.

Docking and Nicking

The inhuman practice of docking horses is illegal in a number of states. It may legitimately be done when disease, such as a cancerous tumor or gangrene, is present. Docking of Hackney and other coach horses is common, and a small portion of the tail of the draft horse, especially the show purebred, is

often removed to give the quarters a neater, plumper appearance when the tail is tied up.

The operation is done with docking shears followed by searing with a hot iron, or the surgeon may remove the tail by a flap operation leaving the stump covered. Young lambs may be docked with a clean sharp knife at castration time or shortly after, but the docking of older lambs and rams should be done by means of red-hot docking pincers. Lambs are likely to die of blood poisoning if the string sometimes applied to prevent bleeding after docking is not soon removed.

"Nicking" is done to make the horse carry the docked tail high and consists in cutting the muscles that hold it down, and then keeping the tail elevated during the healing process. A similar, but more extensive operation, is done to prevent "line hugging," or the habit of flicking the tail over the reins. A crooked tail may be straightened by cutting the muscles on the inner side of the curve, and keeping the tail tied around to a surcingle on the opposite side of the body. Lockjaw, liable to follow such operations, is prevented by hypodermic use of antitoxin (p. 378).

Ringling the Bull

The placing of a ring in the septum, or partition of gristle between the nostrils, for the proper control of the bull is ordinarily done when the calf is 9 to 12 months old. (1) Secure him in a stanchion or stocks, or tie him by a halter strap or rope to a post and press him against the fence. (2) By a quick thrust pierce the septum with a sharp, clean, trocar and canula (Fig. 334). (3) Withdraw the trocar leaving the canula in place. (4) open the hinged copper or gunmetal ring, from which all sharp points and edges have been filed. (5) Smear it with carbolyzed vaseline. (6) Insert one end in the opening of the canula in the septum, then withdraw the canula pressing the ring through in its place. (7) Close the ring and fasten the ends

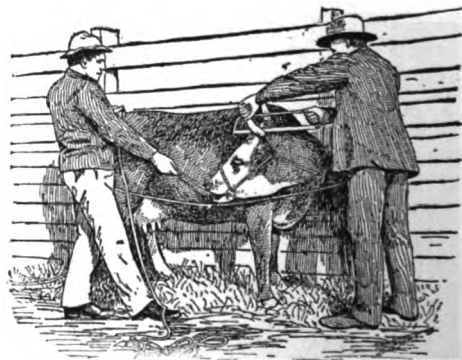


FIG. 444. Method of holding and dehorning a cow with a saw (Ga. Bulletin 111.)

together with screws. (8) Do not tie or lead the bull by the ring for 3 or 4 days.

Firing

This is done with a red-hot puncturing or feathering iron or *thermo-cautery* (Fig. 447) to set up acute irritation and so encourage an abnormal flow of blood to the affected part. Reabsorption of bony deposits or fluids is thus encouraged, or completion of bony growths is brought about, as in the treatment of splints, ringbone, bone spavin, bog spavin, and thoroughpin. Line-firing with a feathering iron also strengthens the tissues and the resulting scar tissue acts as a support or "permanent bandage" to weak or injured tendons or other structures. Firing is best done by a trained operator.

Directions. (1) Restrain the horse with a twitch and side line if not cast or placed upon an operating table. (2) Wherever possible use an anesthetic to prevent suffering.



FIG. 445. Method of holding and dehorning a cow with shears. (Ga. Bulletin 111.)



FIG. 446. How to hold a lamb for docking with hot pincers. Putting the tail through a hole in a board prevents burning the lamb. (Mo. Circular 61.)

(3) Clip off the hair and brush the skin clean. (4) With a cherry red-hot iron quickly and very lightly mark out the firing pattern in lines or punctures as the case may require. (5) Go over each line in succession and lightly with a fresh, hot iron until burned to a chocolate color and serum begins to ooze; or in the same way gradually deepen the punctures. (6) Apply a blistering ointment (p. 871) which is to be washed off in 2 or 3 days. (7) Afterward, twice daily, wipe clean the lines in the direction they run, *not* in a cross direction which might cause them to open into troublesome wounds.

Great care must be taken not to cut through the skin in line firing else sprouting growths will result. This is liable to happen if a white-hot iron is used; a blue-hot iron also is dangerous as it causes sloughing. Firing should not be done in extremely hot or cold weather.

Help at Parturition

How to give it. When assistance proves necessary at foaling, calving, farrowing, or lambing time, it should be judiciously, carefully, and intelligently given. If done rashly or by one who is uncleanly, rough or ignorant, the female, her young or both may be lost, injured, or caused unnecessary suffering. A veterinarian should be employed where possible, otherwise the man who does the work should keep the following fundamental principles in mind: (1) Assistance should be given *only* when absolutely necessary to prevent undue suffering, or loss of life. (2) The hands and instruments should be scrupulously cleansed and adequately disinfected. (3) Success depends upon an absolutely correct understanding of what is wrong in the presentation, deciding upon a sensible and practicable method of setting matters right, then promptly and skilfully carrying out this plan.

The *fetus* (offspring at or before birth) should come through the vagina with the head upon the fore legs, but

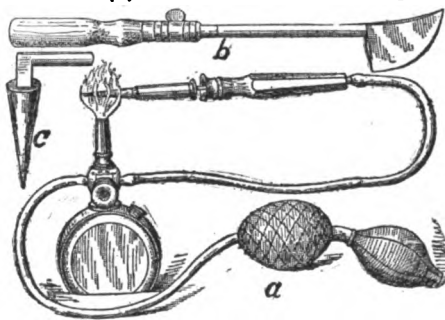


FIG. 447. *a* Thermo-cautery burning alcohol or gasoline under pressure; *b* firing iron; *c* another style point for use with (*b*)

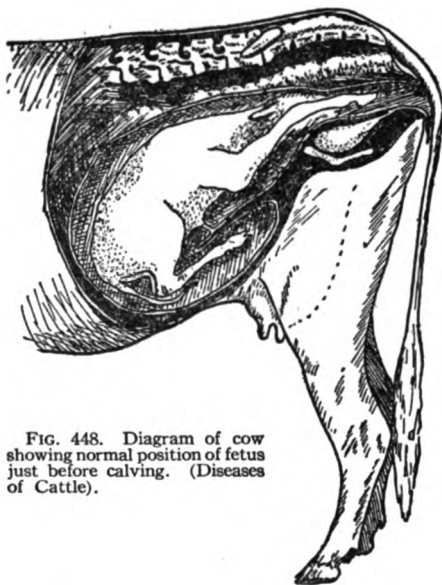


FIG. 448. Diagram of cow showing normal position of fetus just before calving. (Diseases of Cattle).

birth is possible when the hind parts come first. If the presentation is abnormal the operator must work to bring both fore feet and the head into the vagina, or, in case of a rear presentation, to bring the hind feet into the passage and then assist the birth by pulling.

If an examination shows that the position of the fetus is normal the case should be left to nature, help being given only if birth does not follow in a reasonable time. Many a foal is killed at birth by the operator pulling upon the fore feet as soon as they appear, and delivering the body as far as the hips which become immovably caught in the pelvic parts of the mare which have not had time to loosen enough to let them through.

Mares are lost also from inflammation of the womb and blood poisoning caused by infection from the dirty hands or

instruments of a careless operator, while ignorant quacks sometimes sacrifice life by unintelligent methods and rash use of instruments. Failure has often resulted because an unskilled operator has tied cords to a fore and hind foot at the same time, or to different fore or hind feet of twins, and then attempted a forcible delivery.

What to do. (1) Before giving assistance trim the finger nails, scrub the hands and arms clean with soap and hot water, and rinse them with a 2 per cent solution of carbolic acid or coal tar disinfectant. (2) Inject oil or a mixture of powdered slippery elm bark and warm water into the vagina if the passage has become abnormally dry. (3) Pass the oiled hand and arm into the womb, determine the position of the fetus and locate the head and fore legs. (4) Pass the noose of a small, soft, disinfected cotton rope round the pastern of each fore foot in turn—or hind feet in a rear presentation—and by pulling bring them and the head, or hind parts, into the vagina. To bring the feet into place it often is necessary to first push the body back with a repeller (Fig. 449). (5) When the fore feet and head or hind quarters are in proper position, delivery results from steady, strong pulling, directed downward and in time to the efforts of the dam as soon as the body comes in sight. Free use of lubricants always helps.

If delivery prove impossible, the trained operator brings away the fetus in sections with special obstetrical instruments and so may save the life of the mare or cow. With sows and ewes it usually is possible to remove misplaced young with forceps (Fig. 449). If a sow is slow in farrowing, labor pains being lacking or feeble but the mouth of the womb open, a 2 to 3 cubic-centimeter dose of *pituiritrin* will often cause prompt birth of the pigs.

Opening an Abscess

An abscess is a collection of pus in the tissues of a muscle or other part. Often it is so located that it can safely be lanced to let out pus only by one thoroughly familiar with the anatomy of the part. Shallow abscesses, due to bruises, such as those of



FIG. 449. Above, a repeller for aiding cow or mare in difficult parturition. Below, pig forceps.

the shoulder or withers, may be opened with less danger. (1) Clip off the hair. (2) Wash and disinfect the skin. (3) Paint it with tincture of iodine. (4) Locate the pus (if deep-lying) by inserting a grooved needle (Fig. 450). (5) Cut into the abscess at its lowest part and let out the pus. (6) Cleanse the cavity by syringing with warm water. (7) Inject tincture of iodine and hold it in place for a few minutes. (8) Allow the surplus tincture to escape. (9) Pack the cavity with antiseptic gauze or oakum saturated with a mixture of equal parts of turpentine and raw

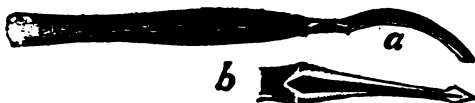


FIG. 450. *a* Type of bistoury to be used in opening the paunch. *b* Grooved needle used in locating a deep abscess

linseed oil, allowing a tag of oakum to hang out of the wound as a drain. (10) Apply oil or lard to the sound skin below the wound to prevent blistering. (11) Renew the packing daily.

Opening the Gullet (Esophagotomy)

When other measures fail to relieve choke (p. 308), the surgeon secures the animal and cuts into the gullet. Clip the hair off, wash the skin clean with soap and hot water and wet it with alcohol then with tincture of iodine at the point where the obstruction is located, on the left side of the neck below and parallel to the jugular vein. Make an incision 3 to 5 inches long through the skin and carefully continue it through the connective tissue and muscle. Holding the lips of the wound apart with the left hand and, avoiding the jugular vein and carotid artery, locate the gullet and draw it outward. Make a small slit lengthwise over the obstruction, remove it, cleanse the wound perfectly, disinfect, then close it with stitches of carbolyzed catgut. Dust the outer wound with boric acid (it need not be sutured) and cover it with absorbent cotton held in place with a bandage round the neck. Withhold feed and water for 24 hours after operating, then allow water and cut hay, but no grain or mashes, for a few days.

Opening the Paunch (Rumenotomy)

When found necessary to open the paunch (rumen) to remove impacted feed, a trained surgeon should be employed if possible. (1) Place the animal in stocks, or secure it with its right side pressed against a wall. (2) Clip hair from the skin high up in the left flank. (3) Scrub the skin clean, wet it with alcohol, then paint with tincture of iodine. (4) At almost the point described for introduction of the trocar and canula in tapping

(Fig. 455), but not quite so close to the rib, puncture the skin and the paunch wall. (5) Introduce a sharp, clean, probed-pointed, curved bistoury (Fig. 450), and continue the cuts downward, making an opening large enough to admit the hand. (6) Put 3 stitches through the lips of the wounds, on each side, to keep the skin and paunch wall together. (7) Place a clean cloth saturated with a 1-1000 solution of bichloride of mercury in the lower part of the wound. (8) With the cleansed hand remove two thirds of the feed. (9) Carefully cleanse and disinfect the wound with the bichloride solution. (10) Remove the 2 lower stitches, turn inward the lips of the wound in the paunch and sew together with carbolyzed catgut, from below upward. (11) Remove upper original stitch when it is reached. (12) Again cleanse and disinfect the internal wound and close the wound in the abdominal wall with silk sutures. (13) Dust the wound twice daily with boric acid and remove the stitches in 6 to 10 days. (14) Feed soft, easily digested feed for 2 weeks.

Opening the Windpipe (Tracheotomy)

The operation of making an opening into the windpipe (trachea) and inserting a silver or plated trachea tube (Fig. 451) through which breathing then takes place, is performed when sore throat or other disease makes breathing so difficult that suffocation threatens. A permanent trachea tube may be inserted to enable a "roaring" horse, or "mechanical choker" to work comfortably.

Directions. (1) Clip, cleanse, and disinfect the skin at a point on the front of the neck a few inches below the throat where the rings of the windpipe can readily be felt. (2) With a sharp sterilized knife cut through the skin down to the windpipe. (3) Insert the knife blade between two of its rings. (4) Grasp one

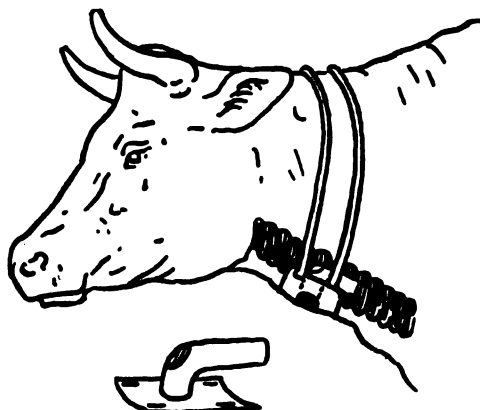


FIG. 451. A trachea tube and diagram showing it in place—the arm pointing down the windpipe, and cords or straps around the neck to hold it.

ring with forceps and cut out a semicircular portion. (5) Grasp and cut from the other ring a similar segment. (6) Insert the sterilized tube, the outer opening of which is covered with fine wire gauze to exclude dust. (7) Remove and cleanse the tube daily. (8) Remove it permanently when the horse can breathe normally, then (9) Cleanse the wound daily with a 2 per cent solution of coal tar disinfectant. (Some surgeons prefer to simply insert the tube between two rings of the trachea).

Let the horse's head down, after making the first incision, to prevent blood flowing into the windpipe. If a tube is not at hand, the lips of the wound may be held apart by a string inserted in one lip with a suture needle then passed around the neck and inserted and tied in the opposite lip of the wound.

Passing the Catheter (Catheterization)

It is necessary to draw off the urine when a horse is paralyzed from azoturia or other disease. When the horse is standing, urination usually is possible; if not, pressure upon the distended bladder with the hand passed into

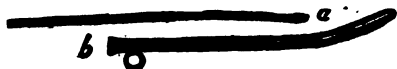


FIG. 452. Flexible catheter for use in stallion (a). Catheter for mare (b).

the rectum may cause it or, in the mare, the act may be induced by passing a finger into the passage to the bladder. If neither plan succeeds or if the urethra is blocked, the catheter (Fig. 452) should be introduced as follows if the horse is down: (1) Turn the horse on to his right side. (2) Apply the twitch. (3) Reach over his back and with the right hand draw out his penis. (4) Grasp it with the left hand and, with the right, pass the clean, smooth, lubricated catheter into the urethra and urge it along its course until it is felt at the anus by the fingers of an assistant. (5) Have the assistant now press the end of the catheter and cause it to bend over at the anus and pass onward and downward into the bladder. Urine then flows freely, provided care has been taken not to block the openings of the catheter with lubricant, the best lubricant being powdered slippery elm bark in hot water. Oil tends to destroy a gum catheter but vaseline may safely be used. A cracked, rough, or dirty catheter is likely to cause infection and troublesome inflammation of the passage. *Never insert an irritant such as salt, an onion or a leek in the sheath or vagina with the object of causing urination.*

Passing the catheter in the mare is a simple matter. (1) Pass the left hand into the vagina until, at a raised point about 4 inches inward, the entrance to the urethra is felt upon the floor of the passage. (2) The short

lubricated mare-catheter is now introduced with the right hand, directed by the left hand into the urethra, and pressed upon until it enters the bladder and draws off the urine.

Passing the Stomach Tube

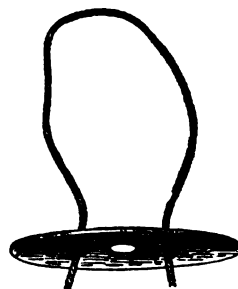


FIG. 453. Wooden gag with hole in centre, used in passing stomach tube or probang.

A half-inch rubber tube or hose smeared with vaseline or wet, powdered slippery elm bark may be passed down the gullet of a bloated cow to draw off the gas, or help relieve choke, or to give safely a large drench of fluid medicine. Have the cow's head held straight, then pass the tube into the mouth and onward into the gullet until gas flows, or the lodged object is reached. A wooden gag having a hole in the centre for the passing of the tube may be used for greater ease (Fig. 453).

The special type of stomach tube used for horses is passed as follows: (1) Wet the tube,

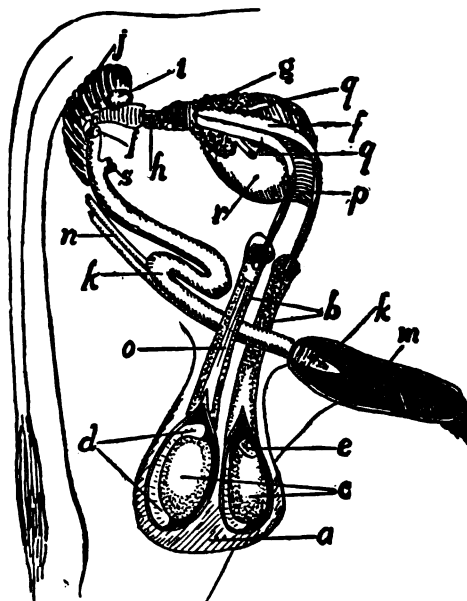


FIG. 454. Reproductive organs of a bull. a scrotum or cod; b serous membranes enclosing testicles (c); d and e parts of canal leading from testicle; f vas deferens (tube leading to ducts); g ureters carrying urine from kidneys to bladder (r); h part of prostate gland; i Cowper's gland; j muscle that hastens the expulsion of urine and reproductive fluid; k penis and i cut portion of same; m prepuce or sheath and (n) muscles that draw it back; o muscle holding testicles; p part of peritoneum or lining membrane of abdomen. (Diseases of Cattle).

dust and rub it freely with powdered slippery elm bark for about 2 feet, or apply vaseline. (2) Lubricate the left nostril. (3) Back the horse into a stall. (4) Have an assistant hold the head steady and somewhat elevated. (5) Pass the tube into the left nostril. (6) With the first finger of the right hand keep the tube pressed on the floor of the nostril and push it onward with the left hand. (7) When the horse swallows, quickly press the tube when it should enter the gullet. (If it enters the

windpipe the horse will cough and air rush out.) (8) When it enters the gullet lubricate each section of the tube before it is pushed into the nostril. When the stomach is reached, gas or semi-liquid food will gush out. (9) If nothing flows from the tube when it has entered the stomach, pump one half to one gallon of warm salt water into it, then allow it to siphon out. (10) Withdraw the tube very slowly after doing the work and give a strong stimulant to prevent fatal shock.

Tapping

The operation of removing gas from the distended paunch of the bloated cow or the blind gut (*cecum*) of the horse suffering from flatulent colic (p. 273). The instrument used is a *trocar* or sharpened rod sheathed in a tube or *canula*; that for use on the horse is longer and slimmer than that used on the cow.

How to tap the cow. (1) Clip the hair from a small patch of skin on the upper left flank about equal distances from the point of the hip, last rib and transverse (crosswise) process of the spine (Fig. 455). (2) Cleanse and disinfect the skin. (3) Stand on the right side of the cow, reach over the back and with a sterilized knife make a cut in the prepared spot, just large enough to admit the sterilized trocar and canula. (4) Insert point of trocar in the cut, then drive trocar and canula inward, downward, and forward their full length by a blow with the palm of the hand. (5) Draw out the trocar and the gas will escape through the canula remaining in the paunch. (6) When the flow of gas stops, put the trocar back in the canula, draw out both, and after pressing the lips of the wound together apply a disinfectant. Tap as high and as close to the spine as possible to prevent the escape of feed, but be sure to avoid striking any bone and to point the instrument downward and forward. If a second tapping is required, do it in a new place.

How to tap the horse. (1) Restrain the horse with nose twitch and by lifting the right fore leg. (2) Prepare as with the cow, but on the *right* flank, high up. (3) Follow directions for tapping cow. As the horse is more liable to inflammation of abdominal membranes from infection, even greater care must be taken in sterilizing skin, knife, and tapping instrument and in disinfecting the wound. If an abscess develop, open it up well to let out the pus, inject tincture of iodine and pack it daily with antiseptic gauze or oakum saturated with a mixture of 1 part turpentine and 2 parts raw linseed or cottonseed oil.

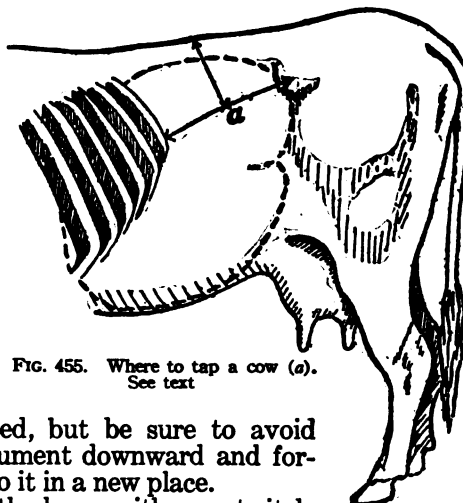


FIG. 455. Where to tap a cow (a).
See text

Trephining

The operation of cutting a disk of bone from the skull with a tubular saw, or trephine (Fig. 456) so as to expose the root of a molar tooth or open a sinus (cavity). It is done

when diseased molar teeth must be removed or pus liberated, and is particularly necessary in cases of chronic catarrh (p. 275) when the nasal discharge has a foul odor or the face bulges because of swelling and pressure of pus inside. It can be done only by an expert surgeon.

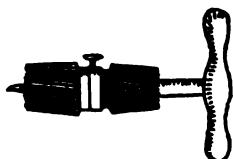


FIG. 456. One form of trephine

Directions. (1) Clean and disinfect the skin. (2) Remove a small portion by dissection. (3) Apply the trephine and rotate it until the bone is cut through and removed. (4) Remove the tooth

by punching it into the mouth; or wash out the pus with a stream of lukewarm 2 per cent solution of permanganate of potash or other mild antiseptic. (5) Insert a plug of oakum firmly to prevent the closing of the wound.

Afterward flush out the cavity daily with the permanganate solution by means of a long rubber tube and nozzle running to vessel hung overhead. A solution of one teaspoonful of bicarbonate of soda or salt to the quart of lukewarm water is excellent after the foul odor has subsided. Tight plugging of the wound daily is necessary to prevent closing.

Unnerving (Neurotomy)

This operation consists in cutting down upon and removing a part of a nerve through which pain is felt so as to remove the power of the animal to suffer pain from some incurable condition. It can be properly done only by the trained surgeon who is perfectly familiar with the anatomy of the parts involved. In the horse it is most commonly done to relieve pain and lameness due to ringbone or navicular disease of a fore foot. Other nerves are sometimes cut when the lameness is located above the fetlock, while "cribbing" has been prevented by a similar operation upon a nerve that controls the actions of certain muscles.

It is important when buying a horse to look for unnerving scars at the sides of the fetlocks or below them, for an unnerved horse having no sense of feeling may suffer a puncture of the sole, fail to show lameness and, from lack of attention, die of lockjaw. Keep the sole of an unnerved foot always covered with a thick leather pad under the shoe.

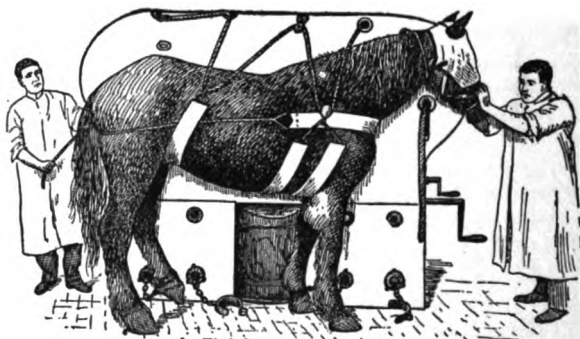


FIG. 457. Veterinary operating table for large animals. The top is usually padded. When the horse is secured by means of ropes and straps, the table is tipped over by means of heavy machinery.



SECTION TWO

INFECTIOUS DISEASES



The War Against Disease

IN ADDITION to preventing and treating the comparatively simple diseases and accidents that befall single animals, farmers, individually and as a group, are constantly waging a war against the infectious ("catching") diseases of livestock. These are especially dangerous for several reasons: (1) They have long existed in many parts of the world, and are likely to appear suddenly and without warning at any place. (2) Once present they spread more or less rapidly from animal to animal, herd to herd, community to community. (3) To control them demands special treatment and extensive, often costly, sanitary measures including disinfection, quarantine, etc. (4) They are in the main incurable and even animals that survive slight attacks are often left unproductive and valueless. (5) They have already taken and are still taking a heavy toll throughout the country. Secretary of Agriculture D. F. Houston says in his 1915 Report: "It has been conservatively estimated on the basis of data for 30 years that the annual direct losses from animal diseases are approximately \$212,000,000." Of this sum, he charges a loss of \$75,000,000 to hog cholera; \$40,000,000 to Texas Fever; \$25,000,000 to tuberculosis; \$20,000,000 to contagious abortion; \$6,000,000 to blackleg; \$1,500,000 to anthrax; and \$5,000,000 to glanders. The 1914 outbreak of foot-and-mouth disease, that swept over 22 states destroying thousands of head of cattle, causing the expenditure of millions of dollars and actually threatening the Nation's entire livestock industry, has left a lesson that will not soon be forgotten. It is the duty of farmers not to forget it.

It is also a duty, as well as a great opportunity, that they should work in close, intelligent, sympathetic coöperation with the officials of State and Nation who are giving their utmost thought and energy in studying the problems of these diseases and their control. If diphtheria or typhoid fever hits a community, we no longer seek to hide the fact and fight the disease with simple, old-fashioned remedies; we welcome the coöperation of doctors, health officers, quarantine laws, and vaccination. So when cholera or tuberculosis or any other infectious ill appears in a herd or flock, its owner should call in every agency that can help him to stamp it out and prevent its spread to other farms. Let this thought sink in: The veterinarian, or health officer, does not insist on vaccination, dipping, quarantine, or slaughter of diseased stock because he wants to, but because these measures are the *only means by which farmers can be protected and helped*. If you are thus put to inconvenience or loss to-day, remember that you may be saving your neighbor from greater loss just as in some future year he may suffer a like trouble in safeguarding you. And thus are each of you guarding the interests of all the other farmers of the country.

The 6 chapters that follow tell the facts about the most serious of the infectious livestock diseases; they suggest what can and must be done in controlling them. It remains for the farmer to see that these things *are* done, whether as cures or preventions, and to lend his aid generously and sincerely in helping to do them.—EDITOR.

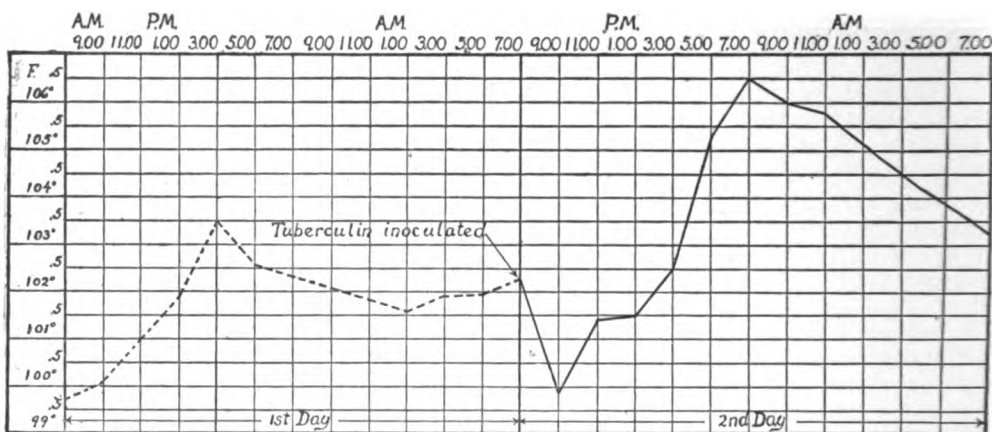


FIG. 458. Chart showing variation in temperature of a tuberculous cow, one day before and one day after it was tested with tuberculin. Note strong reaction (rise in temperature) 12 hours after inoculation

CHAPTER 34

Tuberculosis

Based on a special article prepared by DR. V. A. MOORE, Dean of the New York State Veterinary College, formerly Chief of the Division of Animal Pathology of the U. S. Department of Agriculture, and an acknowledged authority in the field of infectious diseases.—EDITOR.

TUBERCULOSIS is a specific infectious disease from which the human family, cattle, and swine suffer extensively, and which, under conditions favorable to its spread, attacks nearly every species of animal, including fowls and certain fish. It is one of the oldest diseases we know about and was known to the Jewish people during their Egyptian captivity.

Cause. The connection between the disease in man and animals was realized as early as 1370 when in the city of Munich, Germany, it was forbidden to have on sale the flesh of animals affected with it. It was not known until 1865, however, that the disease could be passed from a tuberculous subject to healthy ones. In 1882 a Dr. Koch discovered the bacterium or germ that causes it, which is slender and rod-shaped and so small that it would take from 1,000 to 18,000 placed end to end to measure an inch! Still later in 1898 it was found that the germs that cause tuberculosis in cattle are slightly different from those that cause it in man. This is important, for because of this difference adults do not readily catch the disease from cattle, although children can and do get it from raw milk produced by tuberculous cows. Tuberculosis germs are killed by disinfectants such as a 5 per cent solution of carbolic acid, or a 1 to 1,000 solution of corrosive sublimate (bichloride of mercury), by exposure to direct sunlight for a few hours,

and by heating to a temperature of 145 degrees Fahrenheit for 20 minutes or a temperature of 177 to 185 degrees for an instant. The pasteurization regulations in different places are based on these facts.

How taken. The method of infection with tubercle bacteria is largely through the digestive tract and seldom by means of dirt or dust breathed into the lungs or carried into wounds of the skin. Healthy cattle are most commonly given the disease by "nosing" infected ones or feeding and drinking after them. Feeding calves with milk from tuberculous cows is a very common way of propagating tuberculosis in a herd. The slow development of the disease makes it possible for calves to be infected and still not show signs of tuberculosis for a number of years. Tuberculosis is often found in swine that have been fed upon milk from infected cows. Raw garbage and, of course, the carcasses of animals that have died of the disease, are very liable to produce it in animals that happen to devour these substances.

The Nature of Tuberculosis

Tuberculosis is, in most cases, a local disease in the beginning. The germ finds its way to some organ, where it multiplies. As a result a nodule or tubercle develops, due to the irritation of the tissues by the bacteria or substances that they produce there. As the tubercle becomes larger the central portion dies, leaving a mass of dead tissue; this sometimes turns to liquid which may be taken up by the tissues leaving a cavity. In cattle, however, there is a tendency for the dead tissue to become calcified (filled with lime salts). In fatal cases tuberculosis kills largely by thus destroying tissues or organs that are necessary for the life of the animal.

Where the first of these tubercles forms in the body depends upon the channel of infection. If the germs enter the mouth or throat they may be taken to some of the lymphatic glands about the head; if they are taken directly through the air passages into the lungs they either develop tubercles in the lungs themselves or in glands that drain them; if they are taken into the digestive tract, they may cause ulcers in the lining membranes of the bowels, or, as more often happens, they may make their way into the blood stream. After once gaining entrance to the body, the organisms may thus be carried by means of the lymph or blood stream and lodged in any part of the body, such as the brain, lungs, liver, kidneys, spleen, reproductive organs, bones, joints, muscles, and skin. When the germs have thus been carried to different parts of the body, the disease is said to have become "generalized" in which case one or more organs frequently become thickly sprinkled with small grayish tubercles about the size of a millet seed. Tuberculosis is more often generalized in swine than in cattle. In fowls the liver, spleen, intestines and intestinal glands are most often affected.

As a rule tuberculosis in animals is a chronic disease lasting from one to several years before it kills, but occasionally it is acute, the animal dying within a few months after infection. In these cases the tubercle bacteria spread quickly through the body or else the first tubercle develops in a very vital part.

Symptoms. The symptoms vary according to the location of the tubercles in the body. If they appear in the glands of the throat, these organs become enlarged and swellings will be noticed; if the germs locate first in the lungs, and the tubercles become large, the animal will cough more or less and areas that give a dull sound will be discovered when the chest is tapped or sounded with the fingers; if the tubercles appear in the udder it becomes hard. There are, however, certain other signs of the disease present in most advanced cases. The more important of these are loss of flesh while the appetite continues good. This is always a suspicious indication, especially if accompanied by a cough, a rough coat and tight, harsh skin. Rough or loud breathing sounds are suspicious. In very bad cases the animal often groans when pressure is applied to the chest wall. Hard, painless swellings (enlarged lymphatic glands) under the skin in the region of the groin, above the udder, and about the shoulder or throat are suggestive of tuberculosis. Of course, other diseases might cause similar enlargements. Chronic or habitual bloating,

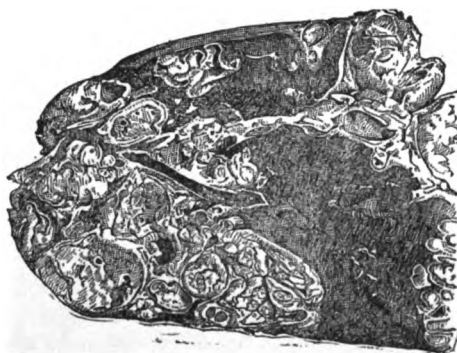


FIG. 459. Section of cow's liver showing nodules caused by the bacteria of tuberculosis



FIG. 460. Piece of omentum or membrane that encloses stomach of cow, covered with tubercles.

accompanied by a good appetite and no sign of any other disease of the digestive tract, especially if there is shortness of breath and cough, is strongly suspicious.

How to Identify Tuberculosis

The diagnosis of tuberculosis is made by one or more of the following procedures, namely: (1) by a physical examination; (2) by finding the germ that causes it in the milk, urine, feces, saliva, etc.; (3) by the character of the tissue changes in dead animals; and (4) by the aid of tuberculin in suspected animals.

The first of these is rarely definite or satisfactory by itself and is of little value to the farmer. Since the germ cannot be seen without a microscope the second method also is useful only to the scientist. The examination of tissues for the presence of tubercles generally is valuable only as a means of proving whether or not dead animals died from, or ever had, the disease.

The only practical, successful test for the farmer and dairyman is, therefore, the use of *tuberculin*.

This is a prepared bouillon or clear broth on which tubercle bacteria have been grown until they will multiply no more, and from which they have then been removed. It is injected into or under the skin of the animal suspected of having tuberculosis, after which the animal is watched for a number of hours for signs of changes or reactions which show the presence of active tubercles, that is, tubercles in which the bacteria are at work. After world wide use and many tests it seems certain that the injection of tuberculin does not start old tubercles into more active growth, make the disease worse if it is present, nor give it to healthy animals. Of course, it must be used carefully and the results very closely observed. It may fail to detect the existence of the disease if it has been improperly made; if applied before the tissue changes occur but after the germ has entered the body; if the tissue changes have become arrested; or when the disease is very far advanced.

How to Make the Tuberculin Test

In the *sub-cutaneous* (under-the-skin) method, about half a teaspoonful (2 cubic centimeters) of the U. S. Bureau of Animal Industry tuberculin is injected with a hypodermic syringe under the skin of the neck or shoulder. If the animal is well no reaction occurs. If infected it will usually show a rise of temperature beginning from 6 to 30 hours after the injection, continuing for from 6 to 10 or more hours, and sometimes reaching 104 or 105 degrees. Occasionally there occur at the same time a loss of appetite, depression, chill, roughened coat and general unhealthy appearance, but those are not necessary features. During this test the animal should be protected from drafts, overheating, sudden change of feed, lack of water or an excess of very cold water, or any condition that might cause a rise of temperature. Some nervous cows show a slight rise of temperature under such conditions even if well; according to Dr. James Law no animal should be tested within 3 weeks of calving or 3 days of a period of heat.

In the more modern *intradermal* (into-the-skin) method, a special form of tuberculin is injected into the skin usually under the base of the tail in cattle, and at the base of the ear in hogs. If the animal has tuberculosis a swelling varying from the size of an acorn to that of a butternut appears at that point

usually within from 18 to 72 hours. This is said by some people to be a more accurate test than the first.

A third method consists of placing a drop of the same kind of tuberculin as is used in (2) in the animal's eye. If it is a "reactor" the white of the eye becomes inflamed and the eye discharges. Usually one of the other methods is preferred.

Importance of Tuberculosis

In 1915, the Secretary of the Department of Agriculture listed tuberculosis as the third most destructive animal disease in this country, estimating the loss it causes each year at \$25,000,000. This alone is reason enough why every farmer should do his best to free his farm of the disease. There is also the danger of its infecting not only his children, but all children who drink milk that is not pasteurized and that comes from cows that may have the disease. One other source of danger, though relatively slight now that the meat inspection service is so thorough, is the possibility of infection by means of meat from slightly diseased cattle or hogs which is not thoroughly cooked before it is eaten.



FIG. 461. Injecting tuberculin in the intradermal method. (Cal. Bulletin 243).



FIG. 462. Typical reaction (swelling) to intradermal test. (Cal. Bulletin 243).

The Control of Tuberculosis in Cattle

In the control of tuberculosis there are two conditions to deal with, namely: (1) herds that are free from it and which should be kept sound, and (2) herds that contain one or more tuberculous animals and from which the diseased individuals are to be eliminated.

How to keep it out. The protection of the sound herd requires that every precaution should be taken to prevent the germ of tuberculosis from gaining entrance to it. New animals should not be brought into the herd unless they come from other herds that are known to be sound, or are kept in isolation until their healthfulness is established. Milk from creameries or whey from cheese factories should not be fed to calves in uninfected herds or to hogs, until it has been properly pasteurized. Animals from sound herds should not be allowed to come in contact with diseased ones at fairs or cattle shows of any kind. Since animals are, in general, less likely to contract disease when they are in good condition, cattle should be given the care, the good feed, the protection and the sanitary surroundings that produce and maintain healthfulness and vigor. Fresh air, sunlight, regular habits in feeding, etc., are just as effective in keeping a herd sound as they are in keeping men and women healthy and strong.

How to rid herds of tuberculosis. The elimination of tuberculosis from an infected herd is a more difficult problem. A number of methods have been proposed but experience teaches that nearly every such herd is a problem in itself, presents its own peculiar difficulties, and requires for its purification the application of just that method that best suits the existing conditions. It is necessary, of course, that the clearly diseased animals be removed from among the rest, so that they and the germs passed off by them cannot come or be brought in contact with healthy individuals.



FIG. 463. Eye of a cow reacting to the ophthalmic tuberculin test. (Cal. Bulletin 243).



FIG. 464. — Injecting tuberculin into pig's ear. (Bur. Animal Industry).

identical and that tuberculin would give a reaction in all infected animals. It started as an official measure and carried indemnity from the state for the condemned animals. Such payment was justified on the grounds of protection to the public and equity to the owners. With slight modifications, the system has continued in operation since its introduction into this country in 1891, although there is a tendency to reduce the amount of indemnity for generalized cases.

European control systems. In Europe there are in operation at least three conservative methods for combatting tuberculosis of cattle. The American plan has not been considered with favor and consequently has not been accepted there to the extent that the European, more conservative methods have been employed in this country. The Bang method, named after its distinguished author, Professor B. Bang of Copenhagen, has been extensively employed in Denmark. It consists in eliminating all of the animals that on physical examination show signs of being infected, and testing the remaining ones with tuberculin. The reactors are then separated from the well animals and kept for breeding purposes or, when it is not profitable to keep them longer they are slaughtered for beef under inspection. In Denmark, however, the farmer is allowed to sell the milk from the reacting but physically sound cows. This method has been applied to over 10 per cent of the dairies of that country which have thus been freed from the disease while their owners have been educated sufficiently to enable them to keep their herds free from infection in the future. The advantages of Bang's method are that it recognizes the property rights of the cattle owners; educates them in the nature of the disease; enables them to build up sound herds with the offspring of infected animals; and affords protection to the public.

The Ostertag method, generally applied in Germany, consists of frequent, thorough, physical examinations of the cows and the removal of all suspicious cases which are

The American system of control, which has been used largely in the United States, consists in tuberculin testing dairy cattle and slaughtering those that give a reaction. It is based on the theory that human and bovine tubercle bacteria are

slaughtered for food under inspection. Tuberculin may or may not be applied. If it is used the reactors are not necessarily separated from the others. The theory on which it is based is that the disease can be detected by a careful physical examination before it has advanced sufficiently for the bacteria to escape.

The third European procedure, known as the Manchester method, is followed more than any other in Great Britain. It consists in making regular examinations of the market milk for tubercle bacteria. If they are found the herds from which the milk came are carefully examined and the cow or cows from which the bacteria came are found and slaughtered. This method seems to deal with the immediately dangerous animals only. However, incomplete as it appears, a great reduction in the number of tubercle bacteria in the market milk of Manchester and Liverpool was reported after its introduction.

The results obtained in the control of tuberculosis have been quite as good in America as elsewhere, with possibly the exception of Denmark. The testing and slaughter of reacting cattle, however, has caused the destruction of many animals valuable for breeding purposes.

If a herd consists of valuable animals the method chosen should aim to save as many of them as possible by following a more conservative programme. If the herd is extensively infected, or if for any other reason the owner can not afford or does not care to exterminate the disease as quickly as might be done, he can follow the German or the Danish method and have, in a few years, with the going out of the old cattle, a young and healthy herd to take its place. In any case, all animals showing evidence of tuberculosis should be promptly removed from the main herd. The essential point is that tubercle bacteria *must not be allowed to escape* from any infected individual. This can be accomplished in many instances by removing the animal from the herd as soon as it gives any evidence whatever of being diseased. This requires of course the coöperation of the owner with the state veterinarian or other authority who can assist him in finding out which of his animals are sick and how badly they are affected.



FIG. 465. Typical reaction (swelling) to test shown in Fig. 464.

Disinfecting stables. One of the most important factors in the eradication of tuberculosis is the thorough disinfection of the stable from which known cases have been removed. Before applying the disinfectant all litter must be removed

and burned or thoroughly soaked with the disinfectant. Then the floors and walls should be thoroughly cleaned by scrubbing them with a hot soda solution before applying the disinfectant. All cracks and crevices must be soaked to the bottom with the disinfectant, if a liquid is used, or if a gas is chosen, they should be thoroughly cleaned to enable it to enter them freely.

For the disinfection of stables, the germicides that are used in solution are more satisfactory than the gases such as formaldehyde, because ordinarily it is impossible to tightly seal the barns and keep the gases in. In applying disinfectants either use a broom or a brush with which the floor, mangers, gutters, and walls are actually scrubbed with disinfectant or else use a spray pump. The disinfectants more commonly used are bichloride of mercury in a solution of 1 to 1,000; 5 per cent carbolic acid (phenol) solution; milk of lime; 5 per cent formalin solution; or solutions of from 3 to 5 per cent of the cresols or coal tar disinfectants.

The eradication of bovine tuberculosis is eventually to be accomplished by the control of the means by which it is spread. The elimination of infected cattle from the market and the proper pasteurization of the skim milk and whey from creameries and cheese factories, before it is fed to calves, would do much to restrict the spread of the disease. Above all, owners of sound herds should *not* add to them new cattle unless these come from *healthy* herds.

A FARMER'S PLAN FOR FIGHTING TUBERCULOSIS

The following extracts are from an address delivered by MR. FRED F. FIELD, a prominent and successful Massachusetts breeder, at the 1917 meeting of the Holstein-Friesian Association of America, and later issued as a bulletin by that organization. Without attempting to enter scientific fields, it tells how one man has gotten results and how others can get them. There is nothing miraculous or mysterious about the methods. It is, as Mr. Field says, "based on sound, scientific, and commonsense theories"; indeed, it is practically a working illustration of the accepted and conservative Bang system already described by Dr. Moore.—EDITOR.

First comes cleanliness. Keep the cobwebs swept from your stables and have them properly whitewashed as often as necessary to keep clean. Get all the sunlight into your stables that is possible. It is absolutely impossible to get too much. Have plenty of fresh air in your barn. You may decide the way to get the fresh air. Modern ventilating systems readily accomplish this result, but if you don't desire and cannot afford to use them, very simple means will accomplish perfect ventilation or a continuous supply of fresh air. As long as there is *plenty* of it and it is fresh, that is all that is necessary. Fresh air is very essential, as it is very important that, as far as is practicable, every breath the animal takes should be new air going into her system and not foul air of any sort.

In other words, treat the animals as human beings are treated for tuberculosis—that is known as the "fresh air" treatment.

Treat the mangers, stanchions, feeding boxes, and floors with disinfectant solution. There are several kinds used that are inexpensive, but the stable fittings and floors must be washed and kept clean and well saturated with germ killer as often as necessary to keep them clean, at least once a week.

The modern stable fittings are more easily cleansed, but they are not necessary or essential in the work. Wood floors and fittings can be made clean and disinfected. Manure should be promptly removed from stables to eliminate any possible danger from this source.

Now we have our barn ready to house the cattle, let's start in to treat the cattle and their offspring.

Assume, if you please, that every breeding cow that you own is tubercular. Now that is solely for your own protection. The animal may be perfectly healthy, but you are taking no chances. Later on we make recommendations about the treatment of these breeding animals.

As soon as the cow drops her calf, the calf should be taken away immediately, never allowing the mother to even smell of it, to say nothing about suckling it, as the calf never should be allowed to have any of its mother's raw milk. If you haven't a calf barn, this calf should be taken away so that it will not come in contact with any of the other animals, old or young, that are reactors or which you have assumed to be reactors.

Purchase a "pasteurizer" which has the "holding" process, which is equipped with a

reliable thermometer; that is to say, it heats the milk to 145 degrees and holds it there 30 minutes. There must be no variation from this method.

Feed your calf on this pasteurized milk from the start. Feed no other. This milk should invariably be fed at blood heat or the same temperature as milk freshly drawn from the cow. The percentage of loss of calves at Dutchland Farms for the past 3½ years has been less under this system of feeding than when we were feeding raw milk or allowing them to suckle their dams.

Never allow these calves, from the time they are born, to mingle with any reacting animals, or any cattle, old or young, which you have assumed to be reactors. As they get older, never allow them to drink water from the same trough or the same bucket that has been used for that purpose by the cattle assumed to be reactors. Water is a carrier of tuberculosis germs.

When they are old enough to turn to pasture, have a double line of fence, 10 to 15 feet apart, between your reacting animals or the assumed to be tubercular ones, so that your reacting animals and your clean ones cannot get their noses together or in any way come in contact with each other, for such practice is certain to result in infection.

You are now raising up a clean herd of animals, (if this system has been *carried out*) among which you will have practically no reactors. It is possible that you might have one occasionally, but in the great number which have been tested at Dutchland Farms in the 3½ years under this system, there have been only 3 reactors in the young animals that were brought up under this system. Application of the tuberculin test at this period (say as yearlings) will determine the progress made in "cleaning up." Employ only a veterinarian of known integrity and skill; such a man will use only a standard preparation of tuberculin. The services of such a man cost no more than those of an ordinary one.

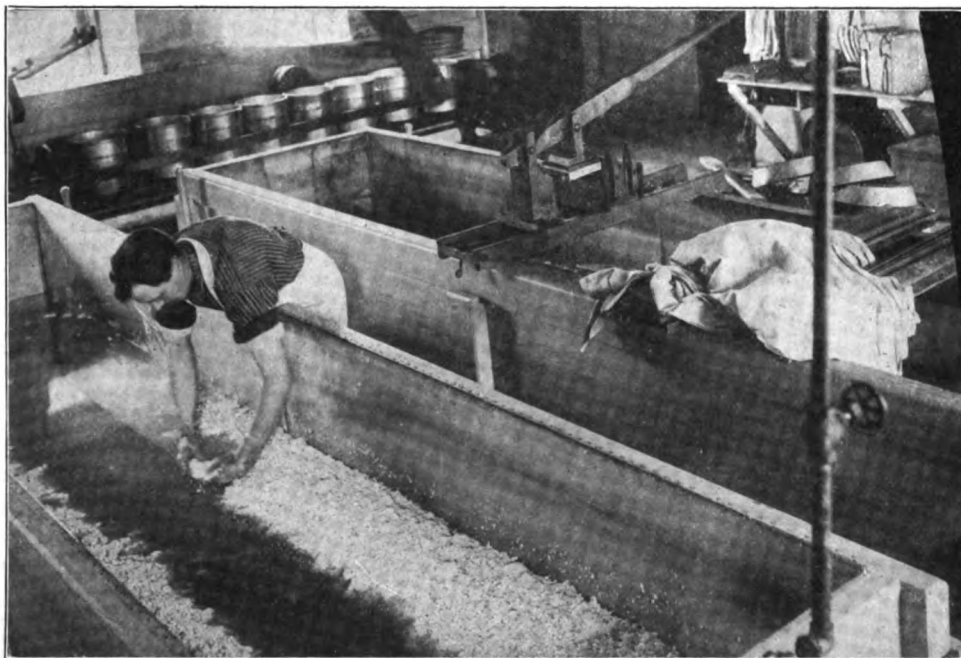
The thing of vital importance to do with your breeding animals is to have samples taken of the sputum or secretions of the lungs and throat for the purpose of bacteriological testing. A skilled veterinarian can get these samples from the cow's throat by the use of the sputum cup. Such a skilled veterinarian

will have such necessary instruments and laboratory connections as will enable him to efficiently do this work. The object of this sputum test is to determine whether the cow is passing off from the nose or throat the infectious tubercle bacilli which spread the disease. If the results of the sputum culture show the presence of the disease germs, it means that the animal is a "spreader." It is well to have your breeding cows tested at least once, by a competent veterinarian, with the tuberculin test; if reactions result, it does not follow that all reactors will by any means be "spreaders." Under this method unless a reactor proves to be a "spreader," she is not *at any time* any source of danger, although she may at any time become so; but applying the sputum test will protect you. The use of the pasteurized milk for the calves eliminates the possibility of infection from this source; the sputum test has determined whether or not the cow is a "spreader." If a "spreader" has been found, she should be removed from the herd. If valuable for breeding purposes, she should be isolated completely. If not valuable, destroy her.

Under the Field method pasteurization differs from the ordinary understanding of the term. Under this method the milk is heated to 145 degrees Fahrenheit (a thermometer must be used) and held there for a period of 30 minutes. There must be no variation from this method. So-called pasteurizing the milk by scalding is dangerous and will certainly result in the death of the calves.

Now by carrying out this method, in a few years you will come to realize that you have turned what looked like a serious loss to you into a profit. In other words you have grown up a new, healthy herd, while at the same time you have preserved your tubercular breeding herd without any material loss, which herd can be maintained until age and condition indicate the time for their disposal.

Calves' navels should be kept disinfected until they are practically dried up. Calves' feeding pails and buckets should be kept clean and scalded. Have plenty of sunlight and fresh air where the calves are kept. Calves' bedding should be dried and not left wet for the calves to lie down in. In other words, treat them humanely, as you would your own babies.



View in a typical American cheese factory

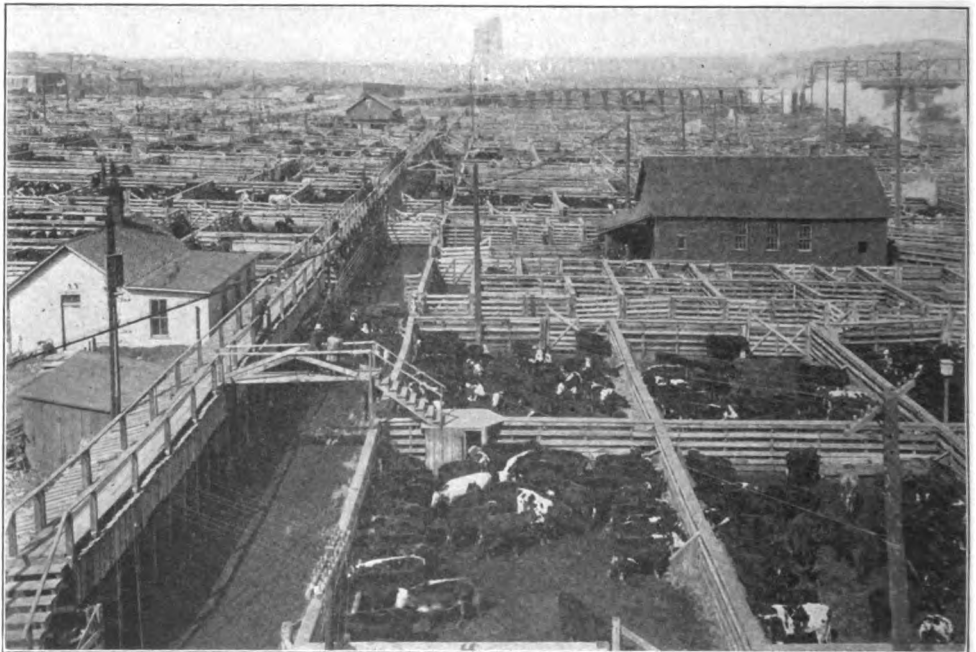


The curing room of a modern cheese factory

ONE OF AMERICA'S REAL OPPORTUNITIES IN AGRICULTURE IS THE DEVELOPMENT
OF ITS CHEESE INDUSTRY



Hog killing can and should be done on most farms. Hothouse lambs (insert) and other specialties mean more effort and risk, but proportionately larger profits



Typical stock yards—where livestock is changed into meat

THE BUTCHERING OF THE NATION'S MEAT HAS BEEN TAKEN OUT OF THE FARMER'S HANDS, BUT HE CAN STILL RAISE AND DRESS HIS OWN SUPPLY



FIG. 466. A combined drinking place and hog wallow. A fine way to spread cholera or any other disease. (Ind. Circular 62).

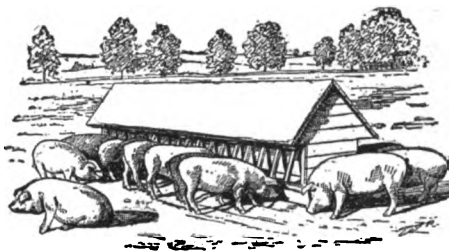


FIG. 467. The self-feeder is a safer feeding method than either the common hog trough or feeding on the ground. (Ind. Circular 62).

CHAPTER 35

Hog Cholera

By DR. R. A. CRAIG, *Chief Veterinarian; Indiana Agricultural Station. Working in the heart of the great hog producing corn belt he has made the most of an unsurpassed opportunity to study this disease in all its phases and to develop, systematize, and perfect the most effective methods for combatting and controlling it.*—EDITOR.

HOG-CHOLERA is an infectious disease of swine in which the characteristic lesions* are of the nature of hemorrhages (collections of blood in the tissues caused by the breaking down of the blood vessels). Thus red spots or blotches may occur on the skin, lymph glands, kidneys, lungs and intestines; and the bone marrow becomes deep red. In addition the digestive, breathing and nervous systems become inflamed and unable to do their work properly. The death rate varies in different outbreaks but probably averages about 50 per cent of all cases; mild forms of the disease are most common in late winter and early spring and toward the latter part of any outbreak.

In the corn belt hog-cholera is more common and important economically than any other infectious disease of farm animals. In 1913 it caused the United States a loss of about \$60,000,000; in 1915, the Secretary of Agriculture estimated the annual direct loss from it at \$75,000,000; and in addition large sums have been spent in studying it and seeking means to control it.

What Causes Hog-Cholera?

The terms *ultra-visible* and *filterable* have been given to the virus or poison that causes this disease, because it cannot be seen with any microscope, and laboratory filters that hold back all visible bacteria permit it to pass through them. Since it cannot be seen or grown in the laboratory, the only way that its presence in the blood from a cholera hog can be proved is by inoculating a pig that is not immune to this disease, and determining whether the disease produced is contagious by placing a second pig in the pen with the inoculated animal. Two forms of bacteria are commonly found in the blood and tissues of cholera hogs, but these are of secondary importance and cause only the lesions in the tissues, *not* the disease itself. The virus is discharged from the body of a sick hog in its feces, urine, and other secretions and excretions and is contained in the blood and tissues as

*A lesion is a change in the structure or a diseased condition of the body tissue or organ. In hog-cholera the primary change, as stated, is in the capillary blood-vessels.

well. Healthy hogs contract the disease by drinking water or eating feed that has become contaminated with such materials.



FIG. 468. Kidney of cholera hog showing characteristic blood spots

How it is Carried

There are sections in the corn belt where hog-cholera is present at all times and which act as centres of infection from which the disease spreads, starting general outbreaks at intervals of 10 or 12 years. The usual method of introducing hog-cholera into a community is through the importation of feeding or breeding hogs that had the disease when purchased, or became affected while in public stock-yards or stock cars. Cholera hogs that are allowed to run at large, and streams polluted with the drainage from cholera-infected yards are common carriers of the disease.

Since infected soil and filth can be carried on shoes, clothing, wagon wheels, horses' feet, etc., visits to farms where hogs are dying of hog-cholera, trips through infested yards,

the visits of stock buyers, stock feed and remedy venders, and the exchange of farm help at certain times are all common methods of spreading the disease. Dogs and birds that travel from farm to farm, and feed on the neglected carcasses of cholera hogs or in infected yards may also distribute it. And the indifference of many stockmen toward improving the sanitary conditions of filthy hog lots and properly disposing of carcasses of hogs that die in the fields and yards, is largely responsible for the ease with which the virus may be spread by the carriers mentioned.

Age and the physical condition of the hog are important factors affecting its tendency to take the disease. Infection with lice, lung and intestinal worms, and abrupt changes in the ration lower the natural resistance of an animal toward disease. Mature, fat hogs usually develop the acute form of hog-cholera when exposed, but they are less susceptible than young ones.

The period of incubation (length of time between the exposure of the hog to the cholera virus, and the development of symptoms) may vary, depending on the susceptibility of the animal, virulence of the virus and method of exposure. When a young hog is exposed by placing it in a pen with a cholera hog, its body temperature usually becomes elevated in from 4 to 5 days, visible symptoms appearing in from 7 to 21 days.

Symptoms

These vary greatly in different cases and outbreaks, but a large percentage of cholera hogs in a herd show these characteristic symptoms: they stand with their hind feet close together or crossed; arch their backs and "tuck up" their abdomens; and, in walking exhibit a staggering gait and weakness in the hind parts.

The earliest symptom is a rise in body temperature reaching 104 to 108 degrees F. which may precede the more noticeable conditions such as loss of appetite and diarrhea by several days. In the later stages of the disease hogs severely or fatally sick may show normal or sub (lower than) normal temperature (98 to 103.5 degrees).

What the herdsman sees. The first symptoms noticed by the person in charge of the herd are usually loss of appetite and depression. Sometimes a disposition to eat earth is noticed. Constipation and diarrhea follow, the color of the discharge varying according to the character of the feed; it may be tinged with blood and have a disagreeable odor. Severe diarrhea is accompanied by extreme



FIG. 469. Cholera or "button" ulcers on intestines of hog. (Mo. Bulletin 7)

weakness. The urine is highly colored. Vomiting may be a prominent symptom.

Coughing when the hog is forced out of its bed, and quickened, labored noisy breathing occur when the air passages and lungs become inflamed. In case the membrane lining the chest cavity is inflamed, these symptoms are more severe, the hog showing evidence of pain when pressure is applied to the chest wall with the hand. Quick, short breathing resembling thumps (p. 331) may occur. If the hog staggers and falls when forced to walk, inflammation of the pericardium (sac enclosing the heart) is indicated. If, as may happen, the central nervous system becomes inflamed, such symptoms as coma (stupor) and convulsions appear.

The secretions from the skin and mucous membranes of the head are abnormal. The edges of the eyelids become covered by a heavy discharge. The thinner portions of the skin around the ears, between the thighs and on the under surface of the body become excessively moist, dirty, or discolored red; just before death the skin of the under surface of the neck, chest and abdomen may become a purplish red. Ulcers and sores may form on the skin, of which large portions may become dead and slough off. A dirty, thickened, wrinkled skin, and a stunted, emaciated (very thin) condition are commonly observed in hogs that have recovered from the disease and become "carriers" of the virus.

How to be Sure

In addition to noting the symptoms just described the farmer who suspects that his hogs may have hog-cholera, should (1) consult a veterinarian (2) carefully review with him the history of the cases and (3) have him kill a sick animal and make a post mortem (after death) examination. These steps should be taken as soon as possible both for the sake of his own herd and in order to prevent the spread of the disease to neighboring herds.

The history of an attack of hog-cholera will resemble that of any other highly infectious disease. Abnormal body temperatures in a large percentage of the animals and the development of other obvious symptoms in several, especially if new stock has recently been brought into the herd, are good evidence of its presence.

The lesions caused by hog-cholera differ in the acute and chronic forms of the disease. Those in the acute form are inflammations resembling hemorrhages; small red spots or blotches occur in the skin, serous and mucous membranes and on the viscera (entrails). In the chronic form the lesions are more advanced, and instead of mere inflammation, there occur ulceration of the skin and mucous membranes, sloughing of the skin, and pleuro-pneumonia (combined inflammation of the lungs and of the membranes that cover them and line the chest cavity).

The post mortem examination should be made as soon after death as possible. The skin, different groups of lymphatic glands, viscera and bone should be carefully inspected. In the cholera carcass the following lesions are commonly found; a red or purplish skin over the under surface of the body and inside

of the thighs; enlarged, reddish-gray or deep-red lymphatic glands; small red spots or blotches in the serous membranes lining the body cavities and covering the viscera; button ulcers in the first division of the large intestine; a general inflammation of the lining membrane of the stomach and intestine; small red spots in the kidneys; red spots or blotches in the mucous membrane of the bladder; enlarged spleen; red spots or blotches on the surface of the lungs; pneumonia of the lungs or pneumonia and pleurisy together; and a deep-red bone marrow.

Intestinal and lung worms may be found but their presence does not mean that they were the cause of the sickness and death of the animals. *Swine plague* is not the same as hog-cholera and the term should not be applied even to that form of cholera in

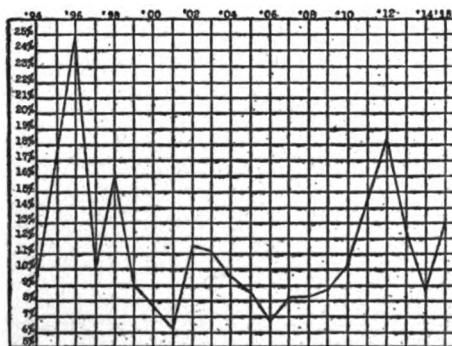


FIG. 470. Chart showing average cholera death rate of hogs in Indiana in percentage of production. Note the result of severe outbreaks in 1896, 1898, and 1912. (Ind. Circular 62).

which the lesions occur principally in the lungs and chest membranes, although this has been commonly done in the past. Swine plague

occurs as an infectious pneumonia affecting a number of animals in the herd, but it does not spread to other herds in the community.

How to Care for a Cholera-Infected Herd

When an outbreak of hog-cholera occurs on a farm, all possible precautions should be taken to prevent the disease from spreading to neighboring herds. If the houses and yards are well arranged and can be cleaned and disinfected, it is not advisable to move the animals to new quarters; but if the quarters are old and poorly constructed, and the yards covered with such litter as corn cobs, manure piles and old straw stacks, it is advisable to provide comfortable, sanitary quarters. It is not advisable to divide the herd into small bunches of a dozen or 20 animals scattered over the farm as the work of caring for them is thereby greatly increased and the infection scattered over a wide area, proportionately increasing the opportunity for the spread of the disease. All hogs showing symptoms of a serious character should be slaughtered.

When the weather is warm, the best place for a sick herd is an open field where there is clean range and a low shed plenty large to accommodate all the hogs and protect them from the sun's rays. In cool, wet weather clean, roomy, dry, well ventilated sleeping quarters free from draughts, and yards that have a good surface drainage are best.

Feed a very light ration consisting of a thin slop made from ground feed, rather than kitchen slops, skim milk or buttermilk. Give with this slop intestinal antiseptics such as sulphocarbolate tablets, or copper sulphate. For convenience dissolve 4 ounces of copper sulphate in 1 gallon of water, and mix 1 quart of this stock solution with every 10 gallons of slop and drinking water. Water the hogs frequently and disinfect the troughs and turn them bottom up after each watering or feeding. Begin this method of feeding as soon as symptoms of cholera develop, and continue it for a week or two after recovery. In addition spray or sprinkle a disinfectant about the quarters daily. The care and treatment of the herd require close attention on the part of the attendant. Indifferent, careless treatment is of no use in this disease.

All of the hogs in the herd, excepting the animals showing serious symptoms, should be treated or vaccinated with anti-hog-cholera serum (p. 404).

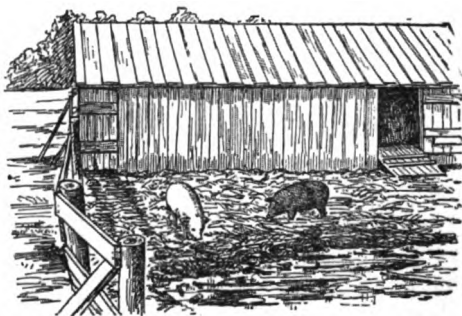


FIG. 471. The wrong kind of quarters for hogs—wet, dirty, possibly infected, and in any case a fine breeding place for disease.

The carcasses of cholera hogs should be burned. Before placing the carcass on the fire cut it open, and make several long incisions

through the skin. A crematory may be constructed by digging two cross trenches, about a foot deep where they cross, and shallow at the ends, and laying iron bars, or an iron wheel over the trenches at the point where they cross. Or woven wire fencing securely fastened in place with stakes may be used for the carcass to rest on. Allow plenty of space between the fire and the carcass to insure good draught.

The yards should be thoroughly cleaned. Old, worthless hog houses with loose board floors should be torn down, and portable houses turned over to permit the removal of manure and the disinfection of the ground under them. Such litter as corn cobs and old lumber should be burned. The manure should be hauled to a field where there is no danger of spreading the disease, scattered over the field and plowed under. The dirt and manure on the floors, walls of the hog houses and fences should be scraped off and

the cleaned surfaces sprayed with a 3 per cent solution of a coal tar disinfectant with enough lime added to make a thin whitewash. Caustic lime has very high value in the destruction of hog cholera infection. It is best purchased in barrels in the form of unslaked, burnt limestone. After it has been air slaked it should be spread over the ground. If a large feedlot is to be covered a lime spreader may be used. After a few days this lime, with all litter, should be scraped up and a second application made. Three or 4 months of warm, sunny weather are sufficient to destroy the hog-cholera virus in well cleaned yards.

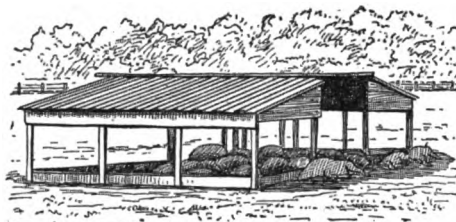


FIG. 472. Good quarters for hogs—provided by a clean, dry pasture and shelter from sun and rain—are very likely to secure freedom from disease.

The Prevention of Hog-Cholera

There is no medicine or treatment known that will actually cure hog-cholera. A knowledge of how to prevent it is, therefore, the most important thing the farmer can learn.

Healthy hogs are safest. If hogs are given proper care they will escape many of the diseases that so commonly affect them. Careful management helps to keep their vitality high, enabling them to better resist the invasion of harmful organisms. The feeding of poor rations (either in amount or composition); bad quarters, poorly ventilated and draughty, and insufficient exercise all lower an animal's resistance to disease.

Do not confine hogs in the same yards throughout the year, or in poorly constructed, wooden floored houses. Such quarters cannot be properly cleaned and the filth that collects favors the development of disease-producing germs. Concrete floors are both sanitary and economical and the natural disinfectants—*sunshine and changes in temperature*—will destroy harmful organisms if given an opportunity.

Hog yards should be well drained. Do not allow manure and litter to collect; fill in all wallow holes with earth. The most satisfactory method for cleaning up old hog lots consists of plowing and seeding them to a forage crop. Keep hogs out of streams in which they may wallow and drink, but which may receive the sewage from other hog yards in the neighborhood, and which are a common source of disease. River or creek bottom pastures that are overflowed occasionally may harbor hog-cholera germs. Clean and disinfect the sleeping quarters, feeding floors and troughs frequently. The first step in disinfecting a floor or wall is to clean it thoroughly. It is best to apply the coal tar or other disinfecting solution with a spray pump. The best method of disinfecting a dirt floor is to remove 3 inches of earth and cover the new surface with lime.

Guard carefully against the introduction of hog-cholera into the herd by the different germ carriers already mentioned. If the disease is present in the neighborhood, the person in charge should require all persons entering the hog yards to first clean and disinfect their shoes, wagon wheels, horses' feet, etc.

Hogs coming from other herds or returning from stock shows should be kept away from the herd until positively known to be free from disease. The quarantine should last longer than the average period of incubation; 3 weeks is sufficient. The incoming hogs should be cleaned by dipping or washing with a 1 per cent water solution of coal tar disinfectant. The quarantine yards should not communicate in any way with the regular yards, and the attendant must observe the necessary precautions against carrying infection from the quarantined animals to the other hogs on the farm.



FIG. 473. How to vaccinate a hog too large to throw. (Wis. Cir. 54)

method in which some of this serum and some hog-cholera blood are injected. This treatment practically gives the hog a mild attack of the disease but also the power to fight it off and to become immune to future attacks for a year or even for the rest of its life.

What the serum is. This agent for the treatment and prevention of hog-cholera was discovered by scientists of the United States Department of Agriculture. The method of producing it as commonly practised is as follows:

A large quantity of hog-cholera blood is injected into the blood vessels of a cholera-immune hog. This is done for the purpose of stimulating the production of antibodies by the body tissues of the immune animal, thus increasing the protective properties of the blood. The hog so treated is termed a hyperimmune, and after waiting 10 days it is bled from the tail and 7 days later killed by cutting the large vessels at the base of the neck. The blood is collected in sterile jars and prepared for use by removing the fibrin or material that clots and adding a preservative. The serum is then examined for such organisms as may produce disease, abscesses and blood poisoning, and its immunizing proper-

In a section where a hog-cholera outbreak occurs and no effort is made to prevent the disease from spreading, the exposed herds should be vaccinated.

How to Vaccinate

There are two methods of vaccinating hogs: (a) the single or serum alone method in which there is injected an anti-hog-cholera serum that renders the animals immune to the disease for a time; and (b) the double or simultaneous

ties tested. If free from disease-producing germs and possessing standard immunizing properties it may be used for vaccinating hogs.

Where serum can be obtained. Several state experiment stations have laboratories for making serum, which they sell to veterinarians and farmers in their state. A number of commercial firms also make and sell it. If buying from one of the latter, be sure that it is reputable and licensed by the U. S. Department of Agriculture.

The virus used in the double method of vaccination is the same as that used in making hyperimmune hogs, and may be obtained from the same sources as the serum. However, it contains the germs of hog-cholera and should be handled very carefully. It is best therefore to use it only on the advice and with the help of an experienced veterinarian. Some states require that it be used by only such men and only with the consent of the state veterinarian.

How to give the single treatment.

(1) For a day before vaccinating give only a light, loosening diet with plenty of water. (2) When ready to operate have the syringes sterilized and everything ready, clean and disinfected. (3) Scrub and disinfect (or paint with iodine) the place where the injection is to be made. This may be the inner region of the thigh or arm, the flank or the side of the neck. (4) Inject under the skin, or better still into the muscle, the required amount of serum. Do not, however, inject more than 5 or 10 cubic centimeters in the case of pigs or more than

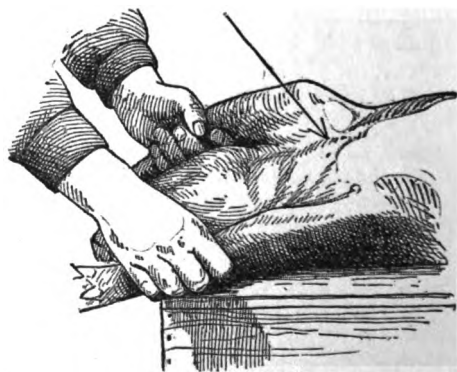


FIG. 474. One way to hold a pig and where to vaccinate in the arm pit. (Wis. Cir. 54)

20 in the case of large hogs at any one point. On giving a large dose scatter the injections over the region selected.

How much serum to use. The size of the dose varies with the size and condition of the animal. Give young hogs a larger dose in proportion to their weight than older ones. If a hog is in low physical condition or has a higher body temperature than normal, give a half more or even double the average dose. In all cases give a good full dose and don't try to skimp the serum.



FIG. 475. The thigh is the commonest place to vaccinate, but the method often results in a spoiled ham.

AVERAGE DOSES OF SERUM AND VIRUS

WEIGHT OF HOG	SERUM USED ALONE	SERUM USED WITH VIRUS
3- 30 pounds	5-10 cubic centimeters	.....
30-100 "	10-25 " "	20-40 cubic centimeters
100-150 "	25-35 " "	40-55 " "
150-300 "	35-50 " "	55-85 " "
300-600 "	50-65 " "	85-110 " "

WEIGHT OF HOG	VIRUS
30-100 pounds	1.0-2 cubic centimeters
100-600 "	2 -3 " "

Precautions and after care. The immunity given by the single method lasts 2 to 5 weeks; that resulting from the double method, except in the case of young pigs, may be permanent. The single is therefore the simpler, cheaper and sometimes safer method, and is satisfactory as a means of protecting a herd in sections where hog-cholera does not occur as an epidemic and where outbreaks are quarantined. Before vaccinating take the temperature of each hog. A temperature of 103.5 degrees in a mature hog or 104 in a young one indicates the presence of hog-cholera, in which case it is best to give only the serum. Otherwise the double method is usually best.

Though not difficult, vaccination should be done very carefully with all precautions as to cleanliness, disinfection, care before and after, etc. Carelessness and poor judgment are likely to result in heavy losses from acute indigestion, blood poisoning or hog-cholera.

Following the operation hogs should be given clean pens or the run of a blue-grass pasture without wallows, dusty places, tall grass or weeds in it. Feed carefully for a couple of weeks while the animals are getting over any effects of the treatment.

Country-Wide Hog-Cholera Control

The most important measures for the control of hog-cholera are the quarantining of farms where outbreaks of the disease occur; the disinfection of stock cars immediately after unloading; and the quarantining of public stockyards. Car shipments of feeding and stock hogs should be unloaded in yards set off for this purpose. These yards should be cleaned and disinfected after each shipment. Shipped-in hogs should be vaccinated.

In the principal swine-producing sections of the United States health officers are unable to enforce quarantine laws relating to hog-cholera. This is largely due to the prevalence of this disease, and the failure of stockmen and veterinarians to realize the economic importance of cooperating with the health officers in its control.

It is exceedingly important, therefore, that every farmer who raises hogs should appreciate what the disease means and be ready to do what he can to stamp it out.

CHAPTER 36

Contagious Abortion

By DR. W. L. WILLIAMS, of the New York State Veterinary College, a man of extensive knowledge and wide experience in the field of dairy cattle diseases, and the acknowledged American authority on the subject about which he writes.—EDITOR.

ABORTION in domestic animals occurring often enough to cause serious economic loss has been recognized throughout history. Strictly speaking, contagious abortion is an incorrect name, for there is no disease which causes actual abortion—that is the death and expulsion from the womb (*uterus*) of the undeveloped young (*fetus*)—without causing any other serious disaster. The abortion is merely a single, secondary occurrence in a more or less complex disease. In an animal infected by this disease, there arises, before the abortion, an inflammation of the uterus which kills the fetus and causes its expulsion as a result of the contraction of the irritated walls of the uterus.

Cause. During the past 50 or more years contagion has been recognized as the principal cause of abortion. Other causes have been suggested such as falls and other accidents, fright and various kinds of foods—especially those which have become contaminated with ergot or “spurred rye,” the smut of corn, and other molds and fungous diseases; but the power of these to cause abortion has not been clearly shown. When hay, grain, grass and other foodstuffs are badly damaged, over a wide area, by unfavorable weather conditions, abortion and its complications appear to be much more severe; but this is owing to the lowered vigor of the animals which weakens their power to resist infections that may be present. Improper food, excitement, accident, etc., certainly play an important part in bringing about abortion and it *may* be that in rare cases some one of these does cause abortion without contagion being involved.

However, in all cases recorded where an aborting animal has been destroyed during the act of abortion or immediately afterwards, and an examination of the carcass has been made at once, unmistakable signs of the contagious nature of the disease have been found in the uterus.

Abortion in different animals. Abortion is most common, causes the most severe losses and has been most studied in cattle. This form may therefore be taken as a type for description, with the understanding that in a general way the same disease in other animals is of much the same nature, though differing presumably in its bacteriology (that is, with regard to the exact germ that causes it). It is not known to what extent contagious abortion of cattle affects other domestic animals though investigators claim to have transferred it by inoculation to sheep, swine, horses, guinea pigs, etc., in a small number of experiments.

Contagious Abortion in Cattle

What causes it. Contagious abortion in cattle is due to a very small microbe or bacillus discovered by Professor Bang of Denmark in 1896 and called *Bacillus abortus*. It is rarely found by itself, but usually in company with other forms of bacteria which are largely responsible for the final symptoms and disasters of the disease, *after* the abortive germ has paved the way for their entrance. The decomposition (decay) of the afterbirth (fetal membranes) and sometimes of the fetus itself cannot be laid to the abortion germ but to organisms that exist in the large intestine and other types, all able to bring about rapid decomposition. It is a colon (large intestinal) bacillus of this type, for instance, that is the chief cause of white scours in calves.

What it does. Contagious abortion in cattle is a chronic infection which is very widely established. Some calves are born infected and soon develop a variety of symptoms such as white scours (or dysentery, p. 301), calf pneumonia and inflammation of the joints. Many are infected soon after birth through their mother's milk. So far as known when once infected they never recover completely, though they may and do recover so far that their reproductive powers and dairy efficiency are not interfered with, and the infection cannot be recognized by any known methods. Serious infection shows itself in the form of a highly complex group of symptoms or phenomena.

Symptoms. When it attacks the uterus the infection may cause inflammation of the womb (*metritis*) or extend forward causing disease of the oviducts (*Fallopian tubes*) through which the unfertilized egg cells pass to the womb. The infection may prevent conception, or, if the cow becomes pregnant, it may become more active and kill the embryo (*fetus*). Sometimes the fetus is thus killed when a half inch or less in length, and expelled without the herdsman seeing it; in this case the cow's condition is termed *sterility* (Sterility meaning, strictly, the inability of a cow to conceive, may be caused by other conditions, see p. 301). If the fetus attains a length of 12 or 15 inches or more before it dies and is expelled, the breeder or dairyman usually sees the act and calls it *abortion*. Still later (but also due to the abortion infection) the fetus may be expelled when nearing full

RECORDS OF 18 HEIFERS INOCULATED WITH ABORTION ORGANISMS IN THEIR FIRST PREGNANCY WITH FEMALE PROGENY

(A—abortion; Au—abortion unseen; B—bull calf; H—heifer calf; S—sterility; X—premature birth; D—newborn calf died.)

NO.	BORN	1912	1913	1914	1915	1916	DISPOSAL
1	December, 1909	A—	Destr'd	Sept. '12.	Gangrene of uterus.		Fetus decayed
2	October, 1909	A—	Died of metritis (p. 301)				
3	February, 1911	S or Au	—Slaughtered before birth		cause of sterility		
4	October, 1910	S or Au	—Slaughtered before birth		cause of sterility		
5	September, 1910	A	A	S—Slaughtered			because of sterility
6	September, 1910	X B	—	B H (6a)	—	B—Same as 5	
6a	November, 1914	—	—	—	—	B	
7	November, 1910	A	B (twins)	D—Died	d of metritis		
8	April, 1911	H (8 a)	—Slaughtered before birth		cause sterile		
8a	December, 1912	—	—	A—Same as 8			
9	July, 1910	B	Retained after birth		Sold as inefficient		
10	January, 1911	B	B—Sold	—bad udder	—gland	grene	half removed
11	February, 1911	S or Au	B	B	B—Sold	as inefficient in dairy	
12	September, 1910	A	H (12a)	B—Died	of indigestion, 1915		
12a	November, 1913	—	—	—	H	H	
13	October, 1910	H (13a)	B	H	B—Sold	— Efficient	
13a	November, 1912	—	—	A	H	B	
14	October, 1910	H (14a)	—	B	B	B	
14a	December, 1912	—	—	—	H—Sold	efficient	
15	October, 1910	B	H	—	B B (Heifer died 1913)		
16	October, 1910	A	B	B	B	H	
17	October, 1910	A	H (17a)	B	H (17b)	H	
17a	September, 1913	—	—	—	B	S	
17b	September, 1915	—	—	—	—	—	
18	December, 1910	A	H (18a)	H (18b)	H	B 1914	
18a	December, 1913	—	—	—	—	B	
18b	1914	—	—	Died	of in-	diges-	tion

SUMMARY: Died or killed, 10; sold in breeding condition, 5; remained in herd of dairying age, 11.

term. If it is dead the delivery is called a *still birth*; if living, the herdsman records a *premature birth*. Since, in its early and latest stages, the real nature of the disaster may thus escape recognition, it is commonly said that contagious abortion of cattle "occurs most often between the first of the fifth month and the last of the seventh month of pregnancy."

Inflammation of the womb may cause a lack of tone so that the fetus, though living and perhaps fully developed, is expelled very tardily. After such a tedious birth (or abortion) the inflammation of the womb, hidden until then by the presence of the calf, is revealed by a discharge of pus; often associated with retained afterbirth. The abortion bacillus is found most easily and in the purest state and greatest amount, in the affected wombs of cattle that have been slaughtered while pregnant, or just after an abortion or a premature birth. But it is very often found in the milk of cows, both those known to be infected and apparently healthy ones. It has been found in the lungs and the joint cavities of new born calves.

How to Know Contagious Abortion .

This is not always possible with exactness. In cows it is safe to assume that contagious abortion is present when abortion occurs, or retained afterbirth follows premature birth or even birth at full term. When sterility is observed, especially when it becomes very common in a herd, it may safely be blamed upon the presence of contagious abortion. When white scours and pneumonia occur in calves, it is quite safe to assume that contagious abortion is playing an important part, though not wholly responsible for the trouble.

We have no ready means, except the immediate examination of carcasses of animals slaughtered right after their abortion, for distinguishing contagious from accidental abortion. Recently it has been claimed that contagious abortion in cows can be readily recognized by means of certain laboratory

blood tests, but these are inaccurate and have at present no real value as means of identification for the purpose of controlling the disease.

The length of time the infection may remain in the body of an animal is unknown. Its presence has been followed closely in individuals for from 4 to 7 years, when it was still as active and effective as at the beginning.

Contagious abortion has no fixed *period of incubation*; that is, it does not take any definite time to develop after infection occurs. Especially, there is no fixed period for the appearance of such symptoms as sterility, abortion, and retained afterbirth, which may occur after months or years, as long as the infection persists in the body of the animal. In the newborn calf, where the disease may follow a stormy course, it may develop very suddenly and destroy the life of the young animal in a few hours, in the form of calf blood poisoning (*septicaemia*), or in a few days, through the effects of calf scours or pneumonia.

How Contagious Abortion is Carried

In cattle the two main, known sources of infection are the udder and the diseased uterus with the fetus it contains. The ways in which the disease spreads from animal to animal are many:

1. The calf may be born diseased.
2. Blood tests show that many calves born in herds where abortion is severe, and fed upon raw milk, take the disease in from 15 to 20 days. If calves born in such herds are fed sterile (boiled) milk, the blood tends to show less reaction, wherefore it is held that the most dangerous source of infection is milk. In the ordinary system of rearing dairy calves, the danger of infection from contaminated milk is enormously greater than in the raising of beef cattle, where each calf nurses its own dam. Dairy calves are commonly fed upon mixed raw milk from the entire herd; if any one cow has severe contagious abortion, seriously affecting her milk or causing profuse discharges

from the genital organs that are likely to contaminate it, the mixing of her milk with that of the entire herd finally exposes each calf to the virulent infection existing in or upon her udder. Frequently the dairyman does not sell the milk from a cow suffering from retained afterbirth or other serious disease of the genital tract, but feeds it to young calves or even places them with the cow to nurse, thus exposing them directly to the infection.

Many dairymen purchase raw skimmed milk from creameries or raw whey from cheese factories for feeding their calves, which then become exposed to the worst type of infection existing in *any* cow in *any* dairy supplying that creamery or cheese factory. This appears

RECORDS OF CALF SCOURS AND PNEUMONIA, AND ABORTION IN A HERD

TIME COVERED	HEIFER CALVES BORN		DIED OF SCOURS AND PNEUMONIA	SOLD AS STERILE	KILLED AC- COUNT TUBERCU- LOSIS	MISCELLA- NEOUS DEATHS	SOLD FOR VEAL	CONCEIVED	PREGNANCY ENDED BY		IN HERD PREGNANT	IN HERD NOT BREED
									CALVING	ABORTION		
May 1, 1909 to August 31, 1912 40 months	593	No.	184	8	56	57	118	170	95	75	0	0
		%	31	1.4	9.4	9.6	19.9	27.8	55.9	44.1	0	0
September 1, 1912 to October 31, 1916 50 months	904	No.	203	6	13	58	0	382	203	22	157	245
		%	22.4	0.6	1.3	6.4	0	44.2	90.2	9.8	17.4	27

to be the principal element in the constant increase in distribution and severity of abortion among dairy herds.

3. The infection most often reaches the uterus through the blood. Apparently this is the chief method of invasion, especially in young heifers, where the infection is first eaten in the food (milk). There is, however, much evidence to show that the infection is frequently introduced into the uterus during service, but aside from this the introduction of the infection through the vulva and vagina from the outside does not seem to play a highly important part.

4. The infection may very easily enter the udder from the outside. Any discharges from the genital organs carrying millions of abortion and other germs necessarily soil the tail and buttocks and gradually fall, trickle or ooze down on to the udder and teats. Thence the infection passes up through the teats and into the udder causing a large percentage of the cases of garget (*mammilitis*), in the course of which disease the bacteria multiply rapidly within the inflamed udder, increasing enormously and very dangerously the bacterial content of the milk. The milker who passes from one cow to another without cleansing his hands may readily carry this infected milk from one udder to another; however, this is not known to be of greatest importance because it is not known how many cows are free from

infection in the udder. Probably the number is much smaller than most farmers suppose.

5. Many investigators believe that a pregnant animal may become infected by eating food soiled with the discharges from the uterus of an aborting cow or otherwise. However, the general contamination of such food has not been demonstrated.

6. It has long been held that the infection is largely spread from animal to animal by ordinary contact; this too has not been proved with any certainty.

7. The part played by the bull in the spread of contagious abortion has not been clearly determined although many feel that it is very important. Certainly bull calves become infected, and there is no evidence to show that they can ever recover entirely. There is, however, little proof of any such volume of infection in any part of the body of the bull as has been shown to exist in the uterus of the pregnant animal and the udders of cows in general. Also the blood of breeding bulls when tested does not generally react so strongly as that of cows and young calves. As far as experiments are concerned it has not been clearly shown either that the bull does or does not often convey the disease. Clinically (that is, in the study of the disease in badly infected herds), there has been found good evidence that he does play an important part in its spread.

No Cure!

There is no cure for contagious abortion. Many alleged cures have been proposed, but each, in its turn, has failed. Some 50 years ago the use of carbolic acid was suggested, but the fact that in all the time that has passed this has not stopped, or even checked, the general prevalence of contagious abortion, denies its success and usefulness. Recently a drug—methylene blue—was brought forward as a cure, and because in some herds where it was used very few cows aborted, it was believed that a cure had been found. In other herds where such large quantities of the drug were used as to cause very objectionable staining of the stable, utensils, milk, and everything else, the abortion was unchecked or it even greatly increased in severity.

Later on it was proposed to control contagious abortion by injecting into the

bodies of pregnant cattle preparations of dead abortion germs, known as abortion *bacterins* or *vaccines*. In some experiments these have apparently done well; in others the animals have aborted worse than before treatment. Consequently, this remedy quite promptly followed carbolic acid and methylene blue into oblivion.

Still more recently, it has been proposed to control abortion by injecting living abortion germs into the cow's blood before breeding her, to bring about immunity by causing a severe infection before a fetus is present to be destroyed. A careful study of reports of experiments published to date shows no definite value in this plan.

Animals that apparently recover are not immune. No very definite immunity can be discovered. If one gathers and studies the data of a large group of cows which have aborted or had retained afterbirth or suffered from some other definite symptom of contagious abortion, it is found that such cows do *not* breed as well as those which have not so suffered: many of them do not conceive at all; and if some do, all available data show that they are more likely to abort, to calve prematurely, or to have retained afterbirth than if they had not suffered seriously during an earlier pregnancy.

Young animals chiefly affected. Contagious abortion is above all a disease of the young. In large herds, it affects chiefly the heifers in first and second pregnancy. In many such herds, the disease in a dangerously active form becomes fixed, so that 30 to 50 per cent or more of the heifers in first pregnancy abort each year. Apparently this is due to the infection which they obtained as calves in the milk. Some hold that the infection of heifers in first pregnancy is due to the eating of contaminated herbage, grass, hay or grain, but such contamination of food has not been demonstrated. The heifers in large herds are usually kept apart, cared for by separate attendants, and largely bred to separate bulls. Their only extensive known source of infection is the milk.

How to Control the Disease

The control of contagious abortion must be based upon thorough sanitary measures. The new-born calf should be protected from severe exposure to the infection, and its general health should be maintained, in order that, as a two-year-old in first pregnancy, it may have the highest possible degree of resistance.

Stabled cows unless regularly groomed become very dirty. It is highly important that when ready to calve a cow should be as clean as is practicable. The best plan is to give her a good bath with soap and hot water (with an antiseptic added) shortly before she is expected to calve, then to place her in a clean, disinfected and freshly bedded stall. Each day until she calves, the hind parts of her body—tail, udder and thighs—should be carefully washed with a 2 per cent solution of Creolin, compound Cresol or other reliable disinfectant, and the vagina and vulva irrigated (douched) with a 1 per cent warm salt solution or a $\frac{1}{4}$ per cent Lugol's solution (compound solution of iodine, p. 369).

It is preferable that some one be with the cow when she calves. He should see that her calf is not permitted to suck until her vulva, tail, thighs, udder, and teats have been very thoroughly washed and disinfected. It is best, also, before permitting the calf to suck, to remove some of the first milk from each of the teats. The calf may then be allowed to suck, or the attendant, with well disinfected hands, may draw milk from the udder for feeding it. The calf should be allowed with the cow only at nursing times, before each of which the disinfection of the udder and surrounding parts should be repeated. In this way the danger to the calf is largely limited to the amount of infection existing *within* the mother's udder.

After the first 8 or 10 days, the calf should not be permitted to suck or to eat raw milk. From this time on, it is safer because of contagious abortion and other diseases as well, to boil or pasteurize all milk for calves. It may then safely be obtained from various sources.

The greatest possible protection would result from not letting the calf have any raw milk at all. However, many new-born calves will not withstand boiled milk, wherefore the plan outlined has to involve some danger of infection during the first 8 or 10 days while raw milk is fed. At the end of that time, boiled or sterilized milk is perfectly safe; the calf thrives upon it; and the danger from milk infection is thus ended.

It is important that the health and vigor of the calves be maintained. New-born calves should always be kept in separate stalls with solid partitions until they are definitely known to be free from disease. Placing several calves together or in separate stalls with slatted partitions always tends to spread any disease from one calf to another.

How to treat calf scours. Should calf scours appear, it should be controlled immediately. This is done most effectively by the liberal use of calf scours serum (See p. 301). The allowance of milk should be greatly reduced. The rear part of the bowel should be washed out with high enemas (p. 366), in order to free it from infectious and irritating material. The best apparatus is an ordinary hospital irrigator of about one gallon's capacity with a pure gum horse catheter attached. The enema should consist of a warm salt solution (1 oz. table salt to 1 gal. of water). The free end of the catheter is inserted slowly and gently into the rectum, while the enema is allowed to flow. The catheter is pushed forward gently, being moved to and fro with a circular motion until it has entered for from 12 to 24 inches. Ordinarily $\frac{1}{2}$ to 1 gallon of water should be used, in order that the irritating contents shall be quite completely washed out of the intestine. This enema may be repeated 3 or 4 times a day. It is highly important that the scours shall be controlled, both for the sake of the sick calf and because the disease is a menace to all the other calves.

How abortion causes permanent sterility. Many animals which have suffered seriously from retained afterbirth never breed again. Sometimes even the lining mucous membrane of the uterus sloughs away completely, leaving no tissue able to furnish nutrition to a fetus. In other cases the uterus and entire genital

tract become attached to the surrounding organs in such a manner that the animal can no longer breed. In many cases the oviducts become completely blocked with pus or lymph, so that the male cells (*spermatozoa*) cannot reach the ovary to bring about fertilization. In others the distal (free, unattached) end of the oviduct becomes stuck to the ovary so that the meeting of the male and female germs is prevented. These conditions produce absolute and incurable sterility, the affected animal becoming an economic burden and, possibly, a menace to sound animals. Any such diseased animal should therefore be carefully examined by a competent veterinarian and if found incurable, should on no account be led to the bull, but should be sold to the butcher.

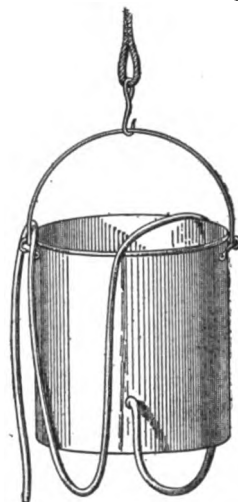


FIG. 476. Good apparatus for irrigating a small number of cows. For a large herd see Fig. 424.

CHAPTER 37

Foot-and-Mouth Disease (Aphthous Fever)

By DR. O. E. DYSON, State Veterinarian of Illinois, who carries among other duties the responsibility of keeping the great Union Stock Yards free from disease, and whose hand to hand struggle with the outbreak in 1914, has fitted him to discuss this subject with thorough knowledge and appreciation of what the farmer needs to know about it.—EDITOR.

FOOT-AND-MOUTH disease is the most highly infectious and communicable disease to which cattle, sheep, other ruminants (cud-chewing animals) and swine are susceptible. It has been prevalent in European countries for centuries and still prevails because heroic methods of eradication, such as have been adopted in the United States (as described below) have never been undertaken there. It may be transmitted to man by direct contact with affected animals and through the consumption of milk from infected cows. In adults the disease usually takes a mild form; in children it is frequently complicated with catarrh of the stomach and bowels, which may lead to fatal results.

Nature and cause. The disease is usually manifested by a high fever accompanied by the formation of blisters and sometimes other serious complications, as described below. The exact cause has not been discovered, but it is clearly some exceedingly small germ or other organism that exists in the liquid that oozes from the blisters of infected animals, in their saliva (spittle), milk and other body fluids; and in the blood during the rise of their temperature.

How it is transmitted. The virus is therefore very easily distributed not only over the bodies of diseased animals, but on their feed and water troughs, stalls, feed, bedding, about their buildings, yards and pastures and on any person, vehicle or any other object they may touch. Healthy animals may then pick it up by licking, eating soiled hay or bedding or by drinking contaminated water, or in any other manner that carries the infecting organism into their systems. Under favorable conditions the virus may remain dangerous for some months. Moreover, animals that have recovered from the disease are thought *not* to be immune.

No cure is known, but cattle affected with a mild form of the disease recover in from 2 to 3 weeks if given feed in the form of mash, fine hay, silage, etc. Plenty of water should be provided so that animals with affected mouths may relieve themselves of accumulated saliva. Mild antiseptics and astringent

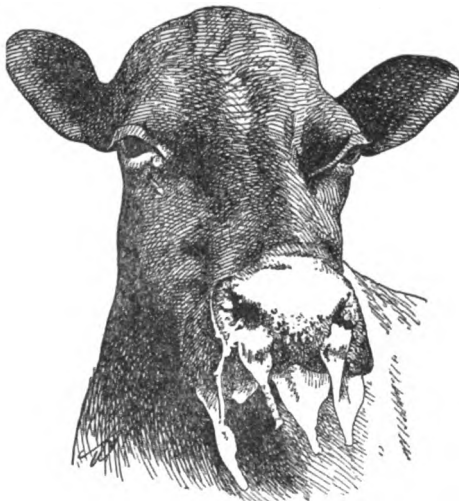


FIG. 477. Cow with foot-and-mouth disease. Note blisters on nose and drooling

lotions [that is, lotions which have a tightening effect, like alum,—*Editor*] should be used to hasten the healing of raw surfaces.

Foot-and-Mouth Disease in Cattle

Symptoms. The first sign of the disease in infected cattle is a slight rise of temperature, staring coat and, usually, a loss of appetite, together with a "tucked up" appearance. If the cattle are running at large the affected animals are inclined to separate themselves from the balance of the herd and lie down. There soon follows the development of vesicles (blisters) on the tongue, lips, cheeks, and gums, and, in cows, on the teats and surface of the udder. These vesicles soon break leaving the involved tissues inflamed and the surface raw. The resulting soreness of the tongue and mouth renders chewing of food slow and painful; in many cases cattle refuse to even attempt to eat. There is also a constant flow of saliva from the mouth. In the early stage of the disease this may be more or less frothy; later it becomes ropy and may hang from the mouth in stringy masses. The constant drooling is accompanied in almost every instance by a smacking of the lips that is characteristic of the disease. In addition to the mouth lesions (sores) one or more of the feet invariably becomes involved. Vesicles develop at the point of the cleft between the toes, also around the top of the hoof. The affected animal may show considerable lameness or tenderness of the feet before the vesicles develop; movement may be slow and painful; and when standing the animal may constantly shift its position as if trying to secure relief from the pain. When well developed foot sores are present the animal often stamps and kicks as if to remove something attached to the foot.

Results and losses. Foot-and-mouth disease is ordinarily of either a benign (mild) or malignant (severe) type. Animals affected with the first kind frequently regain a normal condition within two or three weeks, and thereafter show no sign of having been affected. On the other hand a malignant form frequently causes enormous economic losses, due in part to complicating infections which almost invariably follow, such as: inflammation of the udder, leaving dairy cows more or less worthless for dairy purposes; abscesses, causing the loss of one or more quarters of the udder; and infection of the feet, causing the loss of hoofs and frequently death. The suffering caused by these complications is followed by great loss of flesh, such animals as recover being practically physical wrecks. At least 30 per cent of all calves dropped in herds affected with the disease die as a result of infection. In countries permanently infected with foot-and-mouth disease, the losses caused by even the mild form—such as loss of flesh, falling off in milk production, etc.—amount to from \$10 to \$20 per head. The urgent necessity of preventing the United States from becoming permanently infected is therefore plainly evident; otherwise, the breeding, feeding and marketing of cattle, sheep and hogs would become a hazardous business because breeders and feeders would have to face year after year a prospective loss of millions upon millions of dollars due, in part, directly to the ravages of the disease, and in part to the in-

evitable quarantine restrictions against the free movement of all kinds of live stock from infected or exposed areas to market centres. The sale and interstate shipment of purebred cattle, sheep or swine from infected states would also be prohibited for indefinite periods.

Foot-and-Mouth Disease in Sheep and Swine

Sheep and swine are in most cases affected only in the feet. The first symptom is slight lameness. After one or two days small vesicles develop between the toes and at the base of the dew claws, the inflammation and

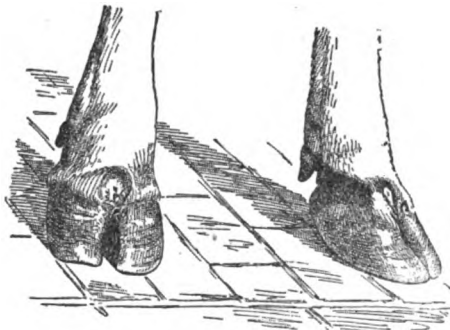


FIG. 478. Feet of an infected cow showing sores between toes



FIG. 479. Characteristic foot-and-mouth disease ulcers on teats.

soreness that follow rendering movement slow and painful. Suppuration (the formation of pus) often takes place, resulting in loss of the hoofs, complicated with ulcerating sores and, frequently, gangrene (dying and rotting) of the tissues involved. In mild cases hogs may apparently fully recover from the effects of the disease in from 1 to 3 weeks, but the greatest danger lies in the fact that hogs which have apparently recovered may act as "carriers" of the disease for an indefinite period. Consequently the only safe

plan to follow for eradicating the disease is to slaughter all infected or exposed cattle, sheep or swine and bury their carcasses in quick lime within the shortest possible time after they are found to be affected. The slaughter and burial should be immediately followed by a thorough cleaning and disinfection of the infected premises (see below).

How to Tell Foot-and-Mouth from Other Diseases

There is another disease of cattle (*infectious stomatitis* p. 300) that resembles foot-and-mouth disease in some respects. The following contrasting table of symptoms, etc., should, however, enable any farmer to tell them apart:

FOOT-AND-MOUTH DISEASE

Always causes foot sores
Highly infectious—rapidly infects whole herd
Readily infects hogs and sheep but never horses

INFECTIOUS STOMATITIS

Never causes foot sores
Less and more slowly infectious. Large percentage of herd escapes
Infects horses but never hogs and sheep

If you are sure *infectious stomatitis* only is present, put the infected animals by themselves and clean and disinfect barns, feet, troughs, etc. But if there is *any doubt* about this, or if foot-and-mouth disease is known to exist anywhere within a few miles, lose no time in reporting the conditions to the state

veterinarian's office. In this way, and only in this way, can your own interests and those of your neighbors, the state and the nation be protected against the possibility of another widespread and enormously costly outbreak, from the effects of which every live stock grower would suffer either directly or indirectly.

What the Farmer Can Do

In the event of another outbreak of foot-and-mouth disease in this country, every farmer in an infected locality should remember the old maxim that "an ounce of prevention is worth a pound of cure," and observe the following precautions to avoid carrying or permitting the carrying of infection into his herds:

1. Report promptly every suspicious case to state or Federal authorities.
2. If your herd becomes infected *do not attempt to hide the fact*. By so doing you will directly interfere with the eradication of the disease, and expose the herds of your neighbors to infection, thereby becoming morally, if not legally, responsible for any losses or inconvenience they may suffer.

3. Protect your own interests by keeping your live stock from coming in contact with your neighbor's stock.



FIG. 480. Always disinfect shoes, wagon wheels, horses' hoofs, etc., before entering or leaving your farmyard if any infectious disease is in the county. (Ind. Circular 62).

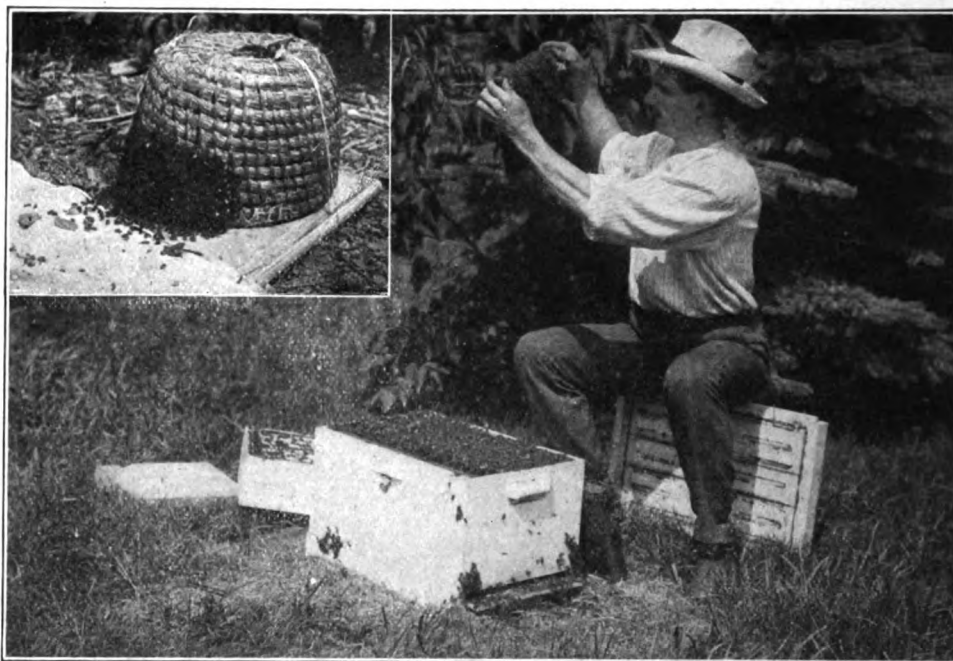


Shearing the farm flock—a harbinger of spring



A shearing contest—typical of the wholesale methods of Western ranches

WHEN EVERY FARM HAS ITS FLOCK, THE NATION'S WOOL CROP WILL BE MORE NEARLY
WHAT IT CAN AND SHOULD BE



The old straw skep (insert) made beekeeping a task; the modern hive makes it a delightful, profitable hobby



For the investment and labor it requires, the apiary is one of the most profitable features of the farm

BEEKEEPING IS A RECREATION, AN ART, AND A PROFITABLE BUSINESS THAT ANY FARMER CAN AFFORD TO LOOK INTO

4. Post notices forbidding live stock buyers, peddlers, tramps, fishermen, or hunters from entering your premises.

5. Do not visit neighbors' farms to inspect stock which show evidence of disease; curb your curiosity and leave such inspections to the proper authorities, *unless you want an opportunity to study the disease on your own farm.*

6. Do not borrow or lend farm implements.

7. Avoid, if possible, driving by premises where foot-and-mouth disease is known to exist. If you must do so spray your horses' feet, wagon wheels, or automobile tires with a good disinfectant before entering your own premises. Before starting out, spread air-slaked lime liberally over driveways, barn-yards, etc.

8. Do not buy stock feed in second-hand bags.

9. Do not feed skimmed milk from creameries unless it has been thoroughly pasteurized.

10. Confine pigeons, chickens, turkeys, etc.; kill stray dogs and cats; keep your own dog tied up.

11. Avoid public gatherings as you would a pest house.

12. Protect yourself by every possible means, even though it may cause you and the members of your family considerable inconvenience.

13. Remember that the contagion of foot-and-mouth disease has no regard for individual ownership, and that carelessness or negligence on your part may be the direct cause of spreading foot-and-mouth disease broadcast throughout the United States. Personal opinion and comfort must be put after public welfare and it has been proved that foot-and-mouth disease can only be eradicated by the slaughter of *all* infected and exposed animals. All states and the Federal government will agree to compensate owners for losses sustained to the extent of a fair cash value for all animals slaughtered and for damages resulting from the cleaning and disinfection of infected barns and premises.



FIG. 481. A barn pasted up for fumigation after being visited by foot-and-mouth disease.

How to Clean up and Disinfect

The following system was followed in practically all states during the 1914 and 1915 outbreaks; several thousand infected premises were disinfected, many times under the most unfavorable conditions. Nevertheless, test animals placed upon these disinfected premises escaped infection in practically every instance.

1. Give special attention to the disinfection of barns or other infected buildings. Tear out and burn all wooden stalls, mangers, feed boxes or floors. Thoroughly scrub steel stanchions with a strong solution of lye, then spray liberally with a 3 per cent solution of Liquid Cresolis Compound. Spray the interior of all buildings with the same solution or Cooper's fluid dip. Use a small amount of lime to tell when the work has been completed.

2. Clean barnyards thoroughly and either burn or cover with lime and bury deep all refuse. Fork over manure piles and spray them with a strong solution of chloride of lime. Remove the top of hay or straw stacks, cut the sides down at least 1½ to 2 feet, burn the material thus removed and spray all exposed surfaces with a 3 per cent formalin solution. Treat hay or straw in barns in a like manner.

3. Thoroughly clean and disinfect all forks, rakes, shovels, etc., used in disinfection work before going from one farm to another. Do the same to wagons as well as the feet and legs of horses used. Fumigate the clothing of each person employed and disinfect his boots. Provide overalls and jumpers for each man in

the gang, these to be left on the premises at the close of each day's work. A thorough job of disinfecting is absolutely necessary to prevent the spread of foot-and-mouth disease.

Fumigating and Disinfecting Materials

For fumigating the clothing of the disinfecting gang use 4 parts permanganate of potash to 5 parts of formalin, or 16 and 20 ounces respectively per 1,000 cubic feet of space to be disinfected. Any tight room, closet or barn may be used. Set the vessel containing the formalin in the middle of the floor, drop in the permanganate, leave at once and do not enter the place for some hours.

One gallon of chloride of lime should be mixed with enough water to form a paste, then diluted to make 3 gallons strength. If care is exercised in preparing and straining lime and chloride of lime solutions they can be applied perfectly with a spray pump. One gallon of Liquid Cresolis Compound added to 32 gallons of water gives a cresol solution of the proper strength. One gallon of Cooper's fluid dip to 39 gallons of water may also be used. Use quick lime to disinfect feedlots, driveways, etc.

Facts About the Disease in the United States

The United States has been invaded by foot-and-mouth disease 8 different times. The first outbreak occurred in 1870, and was followed by others in 1880, 1883, 1884, 1903, 1908, and 1914-1915. With the exception of the last the spread of the disease was confined to a limited area, and was therefore comparatively easily controlled by the slaughter method. Unfortunately in the 1914 outbreak, which started in Michigan, the disease appeared in such a mild form for a considerable period that its true nature was not discovered until after infected and exposed animals had

been shipped from the infected area to the Union Stock Yards, Chicago, Illinois, from which point the disease was spread by various ways and means into 21 other states, within a few weeks. Notwithstanding this fact, complete eradication by the slaughter method was accomplished, thereby safeguarding the live stock interests of the country at large, and conclusively proving the practicability of the method employed.

However, it took many months and cost more than \$9,000,000 to accomplish this result, which indicates the destructive and dangerous nature of the malady.

No proved cases of infection in man occurred during this outbreak, largely owing, no doubt, to the facts that prompt steps were taken to quarantine and slaughter infected herds and that the pasteurization of all market milk produced in infected localities was required.

This outbreak supplied the most notable cases of recovery from the disease on record, namely those of the 785 cattle being exhibited in Chicago at the National Dairy Show at the time when the disease broke loose. These animals were held in close quarantine under ideal sanitary conditions for 6 months and then returned to their respective home farms. However, the expense involved in connection with maintaining an effective quarantine is so great that it would be impossible to carry out the plan generally. It would appeal only to owners whose judgment is guided by sentiment rather than the economic factors involved, and regardless of the risk of spreading the disease that is assumed by the state and the nation if it fails to promptly slaughter every animal affected with or known to have been exposed to the contagion of foot-and-mouth disease.



FIG. 482. Dipping cattle to kill the Texas Fever ticks.
(See next chapter.)

CHAPTER 38

Texas Fever

By DR. MARK FRANCIS, Dean, School of Veterinary Medicine, Agricultural and Mechanical College of Texas, and Veterinarian of the Texas Experiment Station. For 28 years he has devoted much time to the Texas Fever problem and has developed a process of immunization that has reduced the mortality from this disease to about 5 per cent.—EDITOR.

FOR many years it has been generally known by farmers and stockmen that if cattle are taken from any of the more northern states to the south Atlantic and Gulf states, it is only a few weeks or months until they sicken and die. Nothing of the kind occurs among horses, sheep, goats, pigs or other domestic animals, the disease being one of cattle only. Since a large number of well-bred animals are taken annually to Texas with a view of improving the quality of the Texas steer, the disease has been given the name of Texas or acclimation fever. It is known also by such names as red water, murrain, dry, yellow, or bloody murrain, and Mexican, Spanish, splenetic or tick fever.

Investigations begun by the U. S. Department of Agriculture have absolutely proved. (1) that the disease is caused by animal organisms of microscopic size called *Piroplasma bigeminum* that invade the blood stream of infected animals

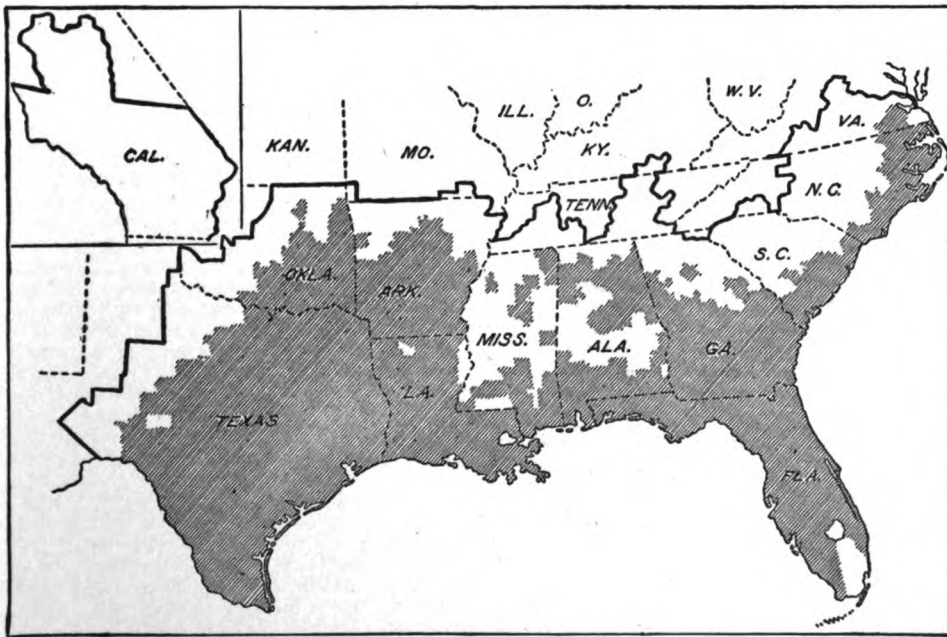


FIG. 483. Map showing how the Texas Fever tick is being forced out of the country. The heavy black line shows its range before the government began its campaign. The white area below the line was tick free in 1917. The shaded still infested portion is becoming smaller every year. (Bur. Animal Industry).

and destroy the red blood cells; and (2) that these organisms are carried from one animal to another by the cattle, or Texas Fever tick. Upon these two facts hinges the whole subject of the disease, its cure and its prevention. If northern cattle taken South are kept in enclosures free of ticks they remain healthy; if permitted to mingle with tick infected stock or to occupy lots just vacated by them, trouble and serious loss usually results.

Symptoms of Texas Fever

It usually requires about 2 weeks for the disease to progress sufficiently to be recognized. The most common symptoms are fever, loss of appetite, prostration, drooping of the ears, arrest of milk secretion, constipation, rapid loss of flesh and the frequent passage of blood colored urine. Sick animals on pasture lie down continually and refuse to follow the rest of the herd, or remain alone near some creek or pond. If the attack occurs during the hot summer months it is usually fatal; in winter or early spring about 50 per cent of the infected animals will survive, but they will be thin, stunted and lifeless for months. The death rate is especially high among mature cattle; yearlings and calves usually survive and are then immune against the disease for life.

If an animal has died before you knew it was sick, and you are not sure of the cause, (1) look carefully for ticks; they may be very small and escape observation. (2) In taking off the skin, notice if the fat is lemon-colored. (3) Open the abdomen and notice the thick greenish bile and enormous spleen. (4) Observe if the urine is blood-colored. If you find the above you may be sure that the disease was Texas Fever. If still in doubt, get some small pieces of clean window glass, spread a *very thin* smear of blood on one side, let it dry, pack the glass carefully and mail it to your experiment station for laboratory diagnosis, writing a letter at the same time stating the circumstances of death and asking for a report by wire. This is important because the animal may have died of anthrax or blackleg.

Treatment for Texas Fever

We have no medicine that cures this disease in a satisfactory manner. If the farmer is vigilant and recognizes the trouble promptly, he can save a good many animals by applying something to destroy the young ticks. A 2 per cent solution of a coal tar disinfectant may be applied with a horse brush. As there is usually very high fever and constipation, give an efficient cathartic immediately. For this purpose we have found nothing equal to a large dose of sulphate of magnesia. For a 500 pound animal, give 1 pound of salts; for a 750 pound animal, 2 pounds, and for a 1,000 pound animal, 3 pounds. Put the salts in a convenient vessel and pour on just enough boiling water to dissolve them and make a very strong solution. Pour this when cool into a bottle having a strong, long neck and drench the animal with the entire dose which usually runs through in from 8 to 10 hours. Small doses are useless, and valuable time may be lost fooling with them. Don't give whiskey, quinine, aconite, or any other medicine, to "break the fever." If the temperature is high, say 106 or more, get a bucket full of ice water, and a horse brush, and brush the animal with this cold water

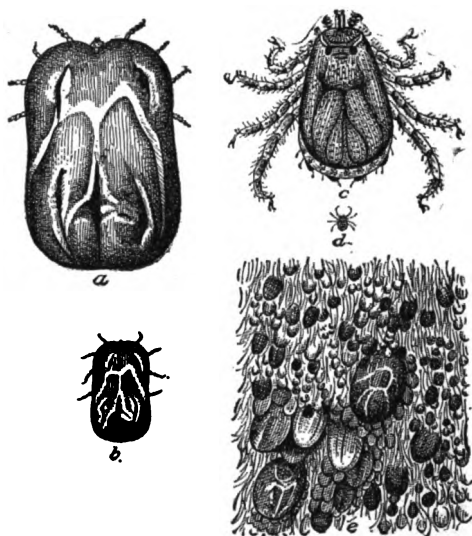


FIG. 484. The Texas Fever tick; a female tick enlarged; b same natural size; c male tick enlarged; d same natural size; e piece of cattle hide infested with ticks of different ages.

every 15 minutes or so, as your common sense suggests, until the temperature falls to say 103 or 104. Keep the animal very quiet and don't disturb it with unnecessary attention.

Preventing Texas Fever by Inoculation

In view of the fact, mentioned above, that an animal that has recovered from an attack of Texas Fever is usually immune for life, there have arisen these questions: (1) "Why not produce a mild, non-fatal attack in young animals, thereby protecting them against future attacks of the acute fatal form?" and (2) "If the tick carries the disease by sucking blood from one animal and injecting it into another, why not cause the desired light attack by doing this same thing with a hypodermic syringe under carefully arranged conditions?"

Years of effort and investigation by the experiment stations of several states, notably Texas and Missouri, have shown that the operations suggested by both these queries are practicable. Furthermore, they have given rise to a system of vaccination or immunization by inoculation that is highly successful. As a result it is now possible for the Southern stockman to buy Northern bred cattle of any desired type or blood line; bring them to his farm; insure them against the disease and resulting (possibly disastrous) loss; and then, by keeping them tick free, bring them to the highest possible market value. If a farmer within the tick-infested areas wishes to get cattle from the North, let him proceed as follows:

Some months before getting them select a suitable pasture and do not permit native cattle to enter it. When the fall rains occur, plow up several acres and sow oats, wheat, or rye, so as to have green stuff for winter pasture. About December 1 buy young animals, not more than 12 to 14 months of age, and have them shipped by express, or freight if this can be done without having to unload them in stock yards infested with ticks. When the car arrives at the station build a large crate on a wagon and haul the animals directly from the car to your premises, the idea being always to avoid the tick. When they have rested a few days inoculate them. To do this go among the range bred cattle and select a 2-year-old steer with ticks on him. Choose a steer, and never a dairy cow, so as to avoid the danger of contagious abortion and tuberculosis. Secure him with ropes, then tie a large hemp twine around his neck, so as to cause the jugular vein to become swollen with blood. Puncture the vein with the needle of a clean sterile (freshly boiled) hypodermic syringe, and fill one or more such syringes with the blood. Immediately inject under the skin of the neck or shoulder of each of the northern calves about $\frac{1}{2}$ dram of this fresh blood. It is best to have a veterinarian help you, but if there is none at hand, do it yourself.

No immediate effects will be seen. About the eighth to tenth day following the calves will appear sick, indifferent to their feed, dull and feverish. This, which we call the "first fever," usually continues 4 or 5 days then passes off. If the calves are on green pasture so as to keep the bowels active no medicines are required, but if they seem constipated give a large dose of salts as directed above. Along about the thirtieth day after inoculation a

second fever spell occurs, similar in duration and severity to the first one, and calling for the same treatment. The deaths during these attacks usually amount to about 2 per cent according to the records of the Texas Station, where about 15,000 head have been treated during the last 20 years. Usually in about 60 days the calves will have regained their former strength and spirit and can safely be turned among native cattle. No further inoculations are necessary.

It is very important not to attempt the inoculation of pregnant heifers, or any mature cattle, because in them the fever sometimes runs high, abortions occur, and a great many become unmanageable and die.

If cold weather has destroyed the green pasture, or if the calves are wild and you can't give them a cathartic without a violent struggle, feed them choice pea-green alfalfa. Select, if possible, alfalfa that has been grown in the irrigated districts of the West where the water is heavily charged with sulphate of lime and magnesia. This is really the easiest way to manage this affair, such alfalfa keeping the bowels and kidneys very active. There may be added some grain, say one pound of corn or milo maize chops for each 100 pounds live-weight of animal.

No further trouble need be expected until about the following June. When the first hot days of summer come on and the grass becomes dry and scanty, it is well to feed the calves once a day and keep them out of the hot sun. Otherwise some of them may relapse and die. It is not safe to risk extreme exposure until about the following December. If this plan is followed in every detail, the losses of Northern bred cattle from Texas Fever need not exceed 3 per cent.

The Cattle Tick and Its Relation to Texas Fever



FIG. 485. A tick-infested steer. Note the ticks all over the body and the thin, weak condition. (Farmers' Bulletin 498.)

Since, as explained above, the cattle tick carries Texas Fever, and since if we can destroy all ticks we can stop the spread of the disease, any information is important that relates to its life history and how to destroy it. A mature female tick well filled with blood and ready to lay eggs is a squarish, plump, olive green, eight legged, small headed insect about half an inch long. At this stage she drops from the host or animal she has been living on, and at once gets ready to lay eggs on the ground. Of course she may be destroyed by birds, ants, cold weather, too much or too little moisture, etc., but if she lives she begins to lay in from 2 to 98 days, depending on the season and other conditions. She may lay for from 4 to 150 days, producing from a few hundred to 5,000 or more eggs, and then dies. The eggs hatch in from 19 to 188 days and the tiny, six legged "seed tick" after a few days of rest crawls up the nearest grass, herbage, or shrubbery. In this stage the young tick does not eat, and unless it can climb on to a host, that is a cow or calf, it starves to death. If it does reach a host it climbs up, attaches itself and begins to suck blood and rapidly increases in size. Later the mating occurs, the males die, the females grow and from 21 to 66 days after attaching themselves to the host, they drop off to lay eggs. Thus the disease is not carried to a healthy animal by the same tick that infests a sick one (unless such a tick be actually carried from one to the other) but by the thousands of offspring of that tick. That is, the disease is transmitted through succeeding generations of ticks with unweakened power to infect healthy stock. Fortunately there are two very simple ways in which the tick can be destroyed. These are:

1. **Rotation of pastures for destroying ticks.** If you divide your pastures into several lots and confine all your cattle in lot "A" for 30 days, then move all of them into lot "B" for 20 days, then into lot "C" for 20 days, and lot "D" for 30 days, and so on, and time these movements so that you will not return them to the original pasture in less than 180 days, you will be agreeably surprised to find that all the ticks have been left behind to perish, and that your animals are clean of them. This method involves no expense, but little effort, and is very successful; the unfortunate feature is that it is so very simple that many farmers refuse or neglect to adopt it!

2. **Destruction of the ticks by dipping.** This is accomplished by building a large dipping vat, filling it with a solution of arsenite of soda, and forcing the calves to swim through it once every 14 days until all ticks are destroyed. State veterinarians and experiment stations



FIG. 486. The same steer 2 months after being freed of ticks. It is fatter, stronger, healthy and valuable. (Farmers' Bulletin 498.)

will explain just how to build such a vat. Two satisfactory dips are made as follows: *Boiled dip.* Put 25 gallons water in a kettle or tank holding 40 or 50 gallons and heat to boiling. Add 24 pounds sal soda and when this has dissolved, 8 pounds finely powdered white arsenic 99 per cent pure. Boil and stir for 15 minutes or longer till the arsenic disappears, then cool and pour in gradually 1 gallon pine tar, stirring briskly all the time. Empty at once into the vat which has previously been three fourths filled with 450 to 475 gallons water. This makes a "low strength" dip suitable for farm use when the cattle can be dipped every 2 weeks for some months. A "high strength" dip, to be used twice only 5 to 10 days apart, is made the same way but with 10 pounds white arsenic and 25 pounds sal soda.

S-B, or self-boiled dip. Put 4 pounds caustic soda in a 5 gallon kettle or iron pail, add 1 gallon cold water and stir until the soda is dissolved. Begin at once to add 10 pounds white arsenic a little at a time, stirring smoothly and regularly all the time, and taking care not to splash or inhale the steam. Try to keep the solution just below the boiling point. When the arsenic is dissolved, dilute to 4 gallons, add 10 pounds sal soda and stir. Add enough water to make exactly 5 gallons and store this stock mixture in tightly corked vessels. For use add 1 gallon to every 124 gallons water to which has already been added a tar stock (1 gallon to 300) made by dissolving $\frac{3}{4}$ pound caustic soda or lye in 1 quart water, adding 1 gallon pine tar and stirring until the mixture becomes uniformly thick like molasses. All this and the actual dipping of the stock should be done carefully and the inexperienced farmer had best obtain the help of some one who has learned how by successful experience; or send to the United States Department of Agriculture at Washington for Farmers' Bulletins 498, 569 and 603 and Circular 207 of the Bureau of Animal Industry. Remember that arsenic is a violent poison and must be handled carefully.

What Texas Fever Does

The losses caused by Texas Fever come under various heads, including: (1) Actual death of native and imported stock in the tick-infested section. The death rate among the latter used to range from 50 to 80 per cent. (2) Retarded development of young stock due to loss of blood sucked by ticks and the destruction of blood by the disease organism. (3) Damage done to hides by ticks. Tick bitten hides are graded as No. 4's, and the leather industries find them a source of much dissatisfaction. (4) Reduced milk production, that has resulted in an estimated yearly loss for 875,000 cattle of \$7,875,000. (5) Restrictions and injuries imposed on trade. Tick infested country is quarantined and animals cannot be removed from it to clean territory except at certain seasons of the year and after thorough dipping. This is a necessary measure, but it puts a certain amount of taint on all Southern bred cattle and an unfair obstacle in the path of the careful breeder and stock raiser who keeps his cattle healthy and tick free.

No one knows just what these losses amount to but by careful investigators it has been

estimated that they reach a total of from \$50,000,000 to \$75,000,000 every year! All this terrible loss can be stopped by destroying the tick, and additional millions of dollars can be added to the wealth of the farmers of the South.

What Can the Farmer Do?

All that is necessary is for the farmers of a county or district to cooperate with each other and with the State and Federal officers to exterminate the tick. The area once infested in the United States was about 1,000,000 square miles. Some 35 per cent of this has already been cleaned and the remainder will be within the next few years. If the farmer cannot secure the cooperation of his neighbors he can easily inoculate all his calves and yearlings twice every winter, say in December and March, thereby protecting them against the disease. But it is far easier and better to aim at the absolute destruction of the tick and the total elimination of the disease. It usually costs \$10,000 to \$15,000 per county to do this work, but it has to be done but once. Even if it had to be repeated each year, it would pay enormously to do it.

CHAPTER 39

Glanders—Anthrax—Blackleg—Rabies

GLANDERS AND FARCY

By DR. W. REID BLAIR, Veterinarian of the New York Zoological Park since 1902 and Consulting Veterinarian of the New York State Department of Agriculture; who for more than 15 years has also had charge of the effective campaign against glanders in New York City.—EDITOR.

GLANDERS is one of the most important contagious diseases affecting horses, asses, and mules. It is readily passed from them to man, in whom it is nearly always fatal. Cattle, sheep, and hogs are, however, immune. It is one of the oldest diseases of which we have real, medical knowledge, and its contagious nature has been recognized for more than 1500 years. It now exists over the greater part of the civilized world. It is more common in cities than in country districts because of the greater congestion of the horse population there, but it is likely to occur wherever traffic in horses is active.

Extensive outbreaks of glanders have swept through the great armies of Europe during all the wars of the last few centuries. In the United States the disease was largely confined to the Northern states up to 1861, but during the Civil War the movements of cavalry and artillery carried it over much of the South. At the close of the war the sale of horses and mules caused a very general spread of the disease from the results of which the country is still suffering.

The sole cause of glanders is a germ known as *Bacterium mallei* which was discovered in 1882. The term *glanders* is generally applied to the disease when the nose, lungs, and other internal organs are affected. When the presence of the disease is shown by an outbreak of ulcers on the skin, the condition is called *farcy* or *skin glanders*. Both forms are contagious, the discharges from the nose in the first type and from the ulcers or sores in the second carrying great numbers of germs.

Both *acute* and *chronic* glanders occur, the former generally in mules and asses but less frequently in horses. The acute form shows the greatest degree

of contagion. The period of incubation—the time between infection and the appearance of symptoms—varies from a few to many days, depending upon the method of infection and the virulence or strength of the germs as well as the resistance of the animal. Months may elapse before a horse that is affected with lung glanders begins to show symptoms of the trouble, and even then the early symptoms may be so slight that for a long time they will excite no suspicion of the



FIG. 487. A severe case of skin glanders showing swellings and sores on the horse's shoulder

true state of affairs. Yet all the time the horse may have been a medium or source through which others have become infected. If such cases are not recognized they may in time cause the infection of the greater part of a large stable of horses, and thus give the disease a firm foothold for years to come. This shows the great need of promptness, accuracy, and honesty in discovering, reporting, and dealing with cases of glanders whether on the farm, in the city stable, or elsewhere.

Symptoms

In some cases of chronic glanders attention is first attracted to the horse's condition by sudden bleeding from the nose, or the animal may cough up bloody mucus or phlegm. However, the first symptoms are generally a "run-down condition," and a dull, dry cough. This condition which resembles heaves ("broken wind") may persist for a long time. Frequently there is a painless swelling of the sheath or udder, and of one of the hind legs. This sudden swelling of one or more of the limbs may disappear and reappear from time to time. Sometimes a running at the nose and other symptoms of nasal catarrh are the first to be observed. Later the mucous discharge from one or both nostrils becomes pus or may consist of a mixture of a greenish-yellow secretion with white masses resembling clotted white of egg, and be streaked with blood; also it sticks to the edges of the nostrils, forming dry crusts. If in such cases the nostrils are held open, sores or ulcers will generally be found on the lining membrane 4 to 6 inches from the edge of the nostrils, where they appear as pit-like depressions, irregular in outline. When these appear the glands under the lower jaw are generally enlarged, being in the early stages of swelling sensitive and painful. Frequently these swollen glands become soft, break through the skin and discharge a small quantity of yellowish, bloody substance which mats the hair.

Symptoms of farcy. In skin glanders nodules or swellings appear in or just under the skin, usually on the legs, the sides of the chest, under the belly and on the sides of the lips. They vary in size from that of a bean to that of a walnut, but are not usually painful. They soon break down and become open, crater-like sores or ulcers with ragged edges. In some instances one or more of the legs become greatly enlarged, numerous ulcers appearing on the under side along the course of the lymphatic vessels.

General Symptoms

Disturbances of digestion and nutrition usually appear before the disease has advanced far. In lung glanders, the general condition of the animal may be remarkably good for a long time. Disturbances appear in the form of a loss of the normal gloss and smoothness of the coat and the elasticity of the skin and a gradual loss of flesh and excessive anemia (thinness of the blood) as shown by the decided paleness of the membranes of the eyes and nostrils. The body temperature is likely to vary constantly between 100 and 103 degrees F., these fluctuations being seen more frequently in horses at work than in those that are allowed much rest.

Acute glanders in horses usually develops from the chronic form, its occurrence being accompanied by rapidly aggravated or intensified symptoms including sudden fever and

great depression. Large numbers of glanderous swellings which soon turn into discharging ulcers appear in from 2 to 4 days, and the lymphatic vessels, just under the skin in all parts of the body undergo acute swelling, causing ridges in the skin to stand out like whip cords. The animal is in a constant condition of fever, loses flesh rapidly, breathes hurriedly and dies in from 7 to 10 days. If the disease develops first in the chronic form in a horse in fairly good condition, overwork is apt to bring on an acute attack.

In the ass and mule in almost all cases the period of incubation is short, and the disease develops in an acute form. The writer has on two occasions seen mules showing well marked evidences of farcy 7 days after exposure to infection.

Recognition or diagnosis of glanders. Since the symptoms of chronic glanders are not clear and definite until the later stages

of the disease and since the really helpful symptoms (such as the appearance of swellings that break into ulcers) never occur until the disease is well advanced, it is not always easy to be sure that glanders is or is not present, on the basis of outward examina-



FIG. 488. Kansas City recorded about 500 cases of glanders a year while it permitted the use of common drinking fountains. The common country watering trough is just as bad. (See also Fig. 489; both from Mo. Board of Agriculture Bulletin).

tion alone. In stables where the disease has already been recognized in some of the animals, that is, in stables that are known to be infected, an elevated temperature in otherwise apparently healthy animals should always be looked upon as suspicious.

Fortunately we have several reliable tests for glanders, which may be employed whenever the diagnosis by physical examination of the appearance of the animal is doubtful. Of these the most important are: (1) The Mallein or inoculation test; (2) The Ophthalmic or eye test; (3) The Agglutination or blood test.

The mallein test is made by injecting mallein (which is a sterilized extract of the glanders bacteria) beneath the skin. If the horse

has glanders there results a fever reaction, and a painful or sensitive swelling of the skin at the point of injection. If the horse does not have glanders, the mallein has no effect or, at most, it merely produces a slight swelling at the point of injection which rapidly disappears. This resembles in method and nature the tuberculin test for tuberculosis.

The ophthalmic or eye test came into use following observations on the action of tuberculin on the eye of tuberculous persons and cattle. In a glanderous animal when a small quantity of diluted mallein is put into the eye, a reaction appears in the form of a *conjunctivitis*, that is, a swelling of the eyelids, an intense reddening of the eye membranes, and a pus discharge. This eye test has been adopted as an official test by the Federal Government, and a number of states.

The agglutination or blood test is a purely laboratory test made with a sample of blood from the suspected horse. None of these tests is absolutely certain, but each may be used as a check upon the other, so that doubtful results with one test may be verified by a positive result obtained with another. The application of several tests at the same time reduces the danger of error to a very small percentage. It is not wise for a horse owner to apply any of these tests without the advice and help of a skilled veterinarian, but it is highly desirable that he should know what they are and how they can help him and other horse owners as well. Only by coöperating with the men who are trained and equipped to make the tests can he get the full benefit of the aid they can give him.

There are several diseases of the horse which may be mistaken for glanders, especially in its earlier stages, the more common being Chronic Nasal Catarrh (p. 275), Lymphangitis (p. 269), and Distemper, or Strangles (p. 274).

How Glanders is Spread

When sound horses, asses, or mules are placed near glandered animals or allowed to eat from their mangers, drink from the same bucket or trough, or wear harness that they have used and soiled with the discharges from their nose or ulcers, there is great chance of the healthy ones becoming infected. Men working among glandered horses are also likely to carry the germ-laden virus or poison on their clothes and gloves; and they are very likely to contract the disease themselves. All that is necessary is for some of the germs to be taken into the mouth with food or water, or breathed in as dust. Common or public feed boxes and watering troughs, livery stables, church sheds, tie rails in front of stores and blacksmith shops are all means by which glanders are spread. Horses used in express or other transportation work, and those handled by traders and gypsies all play an important part in spreading the disease.

A horse affected with chronic glanders in a mild, unnoticeable form may be moved from one part of the stable to another, or worked with one horse and then with another, and in this way be an active agent in the spreading of the

disease without the cause being recognized. Such horses are spoken of as "spreaders."

The clinical or physical cases of glanders, that is, the cases in which symptoms can plainly be seen with the naked eye, are practically all "spreaders" and should be promptly destroyed, and their stables thoroughly disinfected, including their harnesses and watering buckets, brushes, etc. The exposed animals should be carefully examined and tested by a competent veterinarian and those that react should be destroyed. Purchasers of horses (for their own protection) should demand that the animals they propose to buy be subjected to one or more of the reliable mallein tests before purchasing.

Control and Prevention

No medical treatment for glanders is of any value and the many attempts to cure the disease have all been failures. A number of serums and vaccines have been tried recently, but they have as yet been unsatisfactory. Some veterinarians have advocated the repeated injection of mallein as a remedy, but this is a dangerous procedure, and merely establishes a feeling of false security by producing an immunity that lasts but a short time. Moreover, according to generally accepted principles of sanitary police control, glandered horses must be destroyed at once, so the subject of treatment in this disease is of no particular consequence.

The laws governing the control of glanders in Europe are very strict, and practically all our states now have quarantine regulations regarding the movements of glandered horses. It is a disease that must by law be reported to state authorities and both owners and practitioners should conform to the laws and regulations regarding it—not only for their own protection, but for the interests of all live stock, and the public health. In many of our states the laws are most stringent regarding the prompt notification of the state authorities on the part of the owner and the attending veterinarian at the first suspicion of a case of glanders, and after a positive diagnosis is made, the animal is destroyed and the owner compensated by the state. The general practice is to slaughter the reacting animals, and thoroughly disinfect the premises for it is almost unanimously held that it is not safe to keep animals that react to the glanders tests, except under the most rigid quarantine regulations.

Public traffic with horses should be carefully supervised so that new outbreaks of the disease may be promptly discovered. The strict enforcement of these regulations including the systematic use of the mallein tests, especially in those localities where sufficient compensation is provided for condemned animals, has resulted in a great decrease in this disease. Open watering fountains, where diseased horses come into close contact with healthy horses, tend to cause the spread of glanders and other contagious diseases. In Kansas City, one of the world's largest horse market centres, strict quarantine measures and the use of sanitary fountains have done away with glanders.



FIG. 489. Within 10 years after the use of this sanitary hydrant and of individual buckets began in Kansas City, cases of glanders had dropped to not more than 5 a year. (See Fig. 488.)

ANTHRAX OR CHARBON

By DR. F. S. SCHOENLEBER, Professor of Veterinary Science, Kansas Agricultural College. Secretary of Agriculture Houston said in his 1915 report that anthrax causes a yearly loss of \$1,500,000. This and the dangers with which it threatens human beings make it a disease against which every farmer should be forearmed and forewarned.—EDITOR.

ANTHRAX, also called charbon in many localities, is an acute, infectious disease affecting all domestic animals, in which it is almost always fatal, and man, in whom it is generally less acute. Cattle, sheep, horses, and mules are most susceptible. It is one of the oldest diseases known to medical science, being traceable to the time of Moses, but in recent years, due to the modern scientific methods of handling it, the outbreaks are becoming less general and less severe. Its distribution is almost world wide but it is much more common in Europe and Asia than in America. In the United States it is present and occasionally breaks out in a number of localities throughout the country, but it is most common in the lower Mississippi Valley and the Gulf States where it sometimes becomes epidemic. In some districts of California (even the more mountainous regions) where it was introduced some years ago in imported sheep, it has gained quite a foothold. When an outbreak occurs here, the herds or flocks are usually moved to clean soil higher up. The geographical distribution of anthrax depends largely upon the soil and climatic conditions which affect the vitality of the spores of the disease.

Its Cause and Effects

Anthrax is caused by a rod-shaped germ called *Bacillus anthracis*, about 1/2000 of an inch long. The organisms do not live any length of time in that shape, but form spores, which may be compared to the seeds of higher plants, and which being little affected by ordinary heat and cold may remain alive for years. In dense, stiff clays, or where a hard subsoil keeps the surface soil rich in organic matter, they are preserved almost indefinitely, especially where the land is not cultivated. If an animal that has died of anthrax is buried the surrounding soil will be infected for 9 or 10 years, and stock grazing or even driven over the spot may take the disease. A running stream near such a grave will pick up and carry the infection, and grain, hay, etc., grown on and around such places may contain spores and infect animals that eat it. Hides are a very fruitful source of infection and should never be removed from an anthrax carcass. Indeed, owing to its highly contagious nature, anthrax may be spread from one sick or dead animal improperly handled through not only whole herds, but even whole regions.

Death results from the very rapid increase of spores and germs in the body and the resulting production of substances that poison it. The death rate in animals and even in man is often very high. History records the death in 1617 of 60,000 people during one epidemic near Naples, Italy; in 1770 St. Domingo lost more than 15,000 from the disease in 6 weeks. On the plains of Russia and Siberia it is not uncommon for hundreds of thousands of domestic animals and thousands of human beings to die in a single year.

Symptoms

The symptoms of anthrax are not always alike in all animals, but depend largely upon whether the disease is internal or external, acute (sudden) or chronic

(slow). In the internal, which is the most acute, form, the animal shows no symptoms at all but dies very suddenly as if from apoplexy. In the external or slower form the disease begins with high fever and chills, and is marked by the development at the point of infection of a watery swelling which is hot and painful at first but afterwards becomes cold and apparently painless; it soon spreads under the skin along the course of the absorbent and blood vessels. This form of anthrax is usually seen in horses and mules and may occur in man as malignant, pustule, or carbuncular anthrax. The swellings differ from blackleg swellings (p. 430) in that they contain bloody water but no air and when rubbed do *not* give out the peculiar crackling sound of blackleg swellings. The appetite is entirely gone and the animal shows great weakness.

These symptoms are usually followed by uneasiness, such as champing of the jaws, pawing the ground, kicking, and spasms of the limbs. Later, the animal may moan as if in great pain. Breathing becomes difficult, the nostrils are enlarged, the mouth opens, and the membranes of the mouth, nose, and other body openings become a bluish color. All the discharges from the body are bloody. Carbuncles or swellings sometimes appear upon different parts of the body. The animal lies down most of the time and death usually results in a day or two. When the carcass is cut into, the blood is found to be of a tarry nature both in color and consistency. The spleen is nearly always enlarged in the slower form, being in some cases several times larger than normal. Nearly all of the organs are dotted with small red blood spots caused by the breaking down of the blood vessels.

Treatment and Prevention

There is no successful treatment for this disease, which can very seldom be cured. The only way of combatting it is to prevent its spreading by means of quarantine measures, sanitation, and vaccination.

The germs are carried on the feet of animals and beaks of birds and may be found in the feces of dogs and other flesh-eating animals for many days after they have eaten flesh from anthrax carcasses. The hornfly and ordinary house fly may also spread the disease. In handling carcasses or diseased animals, the greatest precautions are necessary since the germs are so numerous that man is very easily infected, especially if a person who comes in contact with the sick animal or carcass has a wound or scratch of any kind upon his hands. However, the disease does not seem to be spread through the milk of animals.

What to do. At the first symptom of the disease, report at once to the state authorities who will take complete charge and in all probability isolate and vaccinate the well animals, direct the disposition of the carcasses and oversee the disinfection of the premises.

All the carcasses should be wholly destroyed by burning, skin and all. If this is impossible they should be buried at least 6 feet deep with a large amount of lime placed both below and above them. Bury all blood-soaked soil with the carcasses and kill any germs on spades, shovels, and other tools used by passing the tools through a flame. Then sterilize the ground around the grave by burning the area over with straw, hay, or crude oil, or by covering it thoroughly with lime or a good strong coal tar disinfectant or crude carbolic acid. Infected lands must be well drained and cultivated.

Vaccination

Since medical treatment has not proved successful, the different forms of vaccinations

have been tried out with varying results. In all infectious diseases it has been found that a possible means of prevention or control lies in furnishing the susceptible and exposed

animals with artificial immunity. In this way such diseases as blackleg, hog cholera, and rabies are kept under control. Many animals prove to be naturally immune to some diseases, while others must be made so by inoculation with suitably prepared materials.

Modern investigations and discoveries

have finally produced a serum for use against anthrax but, as with most of these serum and vaccine products, for the best results it should be used only by a person familiar with its actions. State experiment stations or veterinarians can supply the latest information and full directions concerning these materials and their use.

BLACKLEG OR QUARTER ILL

By DR. F. S. SCHOENLEBER, Professor of Veterinary Science, Kansas Agricultural College. Secretary Houston holds this disease responsible for a yearly loss of \$6,000,000; but under Dr. Schoenleber's direction there has been developed a highly efficient method for preventing it and cutting down this heavy toll on our cattle industry.—EDITOR.

BBLACKLEG is an infectious disease of young cattle occurring in all parts of the world, but mostly in the range countries and breeding sections where the animals are quite numerous. On the average farm where comparatively few are raised, it does not seem to have gained a foothold; thus, in the United States, it is, in general, more common in the central and western sections than in the East and South. It occasionally attacks sheep, goats, and swine; man, horses, and poultry are only slightly liable to it. It is most common in spring and fall because of favorable conditions of temperature and moisture at those times; but it may occur at any time. Animals are most often affected after sudden changes of weather, when either gaining or losing flesh rapidly, when suddenly weakened, or when low in vitality from any cause.

What it is and what causes it. Blackleg is a very rapidly fatal disease affecting the muscular tissues of the body and accompanied by fever, a rough, staring coat, thirst, loss of appetite, and inability to move rapidly because of extreme pain in the back, neck, or one quarter (never below the knee or hock joint). Because it usually affects only one quarter, it has been called "quarter ill" in some places. It is caused by a rod-shaped germ, so small that it would take 8,000 to measure an inch, which enters the body tissues through the skin, wounds, etc.

Symptoms

The first noticeable symptoms are dullness, thirst, and lack of appetite. The animal does not feed with the rest but remains by itself, lies down and can be made to rise only with difficulty; when it is made to move it acts quite stiff or is more or less lame, usually only in one quarter. The affected parts usually show more or less swelling which feels hot to the touch, is very painful and which under pressure (or if the hand is pressed and moved along over the parts) gives forth a crackling sound, showing that air bubbles are present under the skin. The blackleg organism grows and multiplies in the muscles away from the air but in so doing forms gas or air bubbles that give the swelling a drum-like feel or look. When cut into, the flesh of the swellings looks black, has a very distinctive offensive odor, and usually discharges a frothy, bloody fluid which becomes almost black as the disease progresses. Death results in from a few hours to 3 days,

often during a night. When an animal dead with this disease is examined, besides the drum-like swelling of the skin over the affected parts, there is often an escape of dark, frothy liquid from the natural body openings.

Prevention by Vaccination

There is no satisfactory method of treating animals sick with blackleg. The only hope is in preventing its spread by vaccinating well animals. But owing to the nature of the disease and the fact that it is not uniformly distributed over the country it is advisable not to vaccinate the herd unless it is actually infected or unless the disease is known to exist within a few miles.

There are many blackleg vaccines on the market all made in practically the same way, though often put up in different forms—some as pills, some as powders, others in cord form. Where the disease appears in a mild form, or where nothing else is available,

these vaccines are fairly effective and should be used; but when it becomes stronger and the infection more virulent, they are uncertain and do not always protect. In such cases it is advisable to use a new type of serum first made in the Kansas State Agricultural College laboratories and now being used on thousands of calves with practically perfect results. This serum is prepared in two forms, one for use in herds in which the disease is actually present; the other for use in healthy herds only, as a protection against outside infection.

What the farmer can do. (1) When blackleg appears or is suspected, get in touch with the state veterinarian or the state agricultural college to find out about any special

state regulations regarding the disease, and also about the best way to obtain vaccine. (2) When an animal dies of blackleg, do *not* skin the carcass and feed it to the hogs, but burn it *at once*, or bury it *deep* to prevent its spreading the infection. (3) In disinfecting stalls, sheds, etc., use solutions of carbolic acid, copper sulphate or bichloride of mercury (corrosive sublimate). Lime and copperas (iron sulphate) do not seem to kill the blackleg germ, nor do ordinary changes of heat and cold have any effect upon it. In fact, when a feed lot or field once becomes infected, the germs are very apt to remain active there for many years, since it is practically impossible to disinfect such premises without thoroughly cultivating them.

RABIES OR HYDROPHOBIA

By DR. V. A. MOORE, Dean of the New York State Veterinary College, who stands in the very front rank of authorities on infectious diseases of animals.—EDITOR.

RABIES or hydrophobia is an acute, infectious disease affecting all warm-blooded animals. The dog is most commonly attacked, though all of the canine (dog) and feline (cat) races suffer from it more than other species. It is passed from animal to animal or from animal to man only by the bite of the rabid individual (or in the laboratory by direct inoculation). The disease has long been known and feared; the infection of man by wolves was recorded in 1591. The first outbreak in this country was reported from Massachusetts in 1768, and the death of a large number of horses, cattle, and sheep and of a few human beings is caused by it each year. Most cases of rabies in man and domestic animals come from the bites of rabid dogs, although in the last few years much damage has been done in the Northwestern states by coyotes that have contracted the disease and passed it along among themselves and to the animals and even the children of farmers in that region. Strenuous efforts are therefore being made by the people in coöperation with the United States Department of Agriculture to exterminate the coyotes by means of poison, traps, and shooting.

Cause

The cause of rabies is not positively known other than that it is a specific virus that can pass through a porcelain or Berkefeld filter without losing its effectiveness. When a person or animal is bitten, this virus, which is carried in the saliva of the rabid animal, enters a torn or broken nerve, travels through it to the brain, and starts the disease anew. The period of incubation (time that elapses between the bite and the appearance of symptoms) varies with the location and character of the bite, but rarely exceeds 60 days. Average periods for different species have been given as follows: in man 40, dogs 21-40, horses 28-56, cattle 14-80, cats 14-28, pigs 14-21, goats and sheep 21-28, birds 14-40, rabbits 12-62.

Symptoms

The symptoms vary with the two forms of the disease namely, *furious* and *dumb* rabies. In the former they appear very gradually. The dog may be more restless or affectionate than usual, seeking to be near its master, licking his hands

and face and apparently seeking sympathy and assistance. Even at this stage the saliva contains the virus and can transmit the disease to open sores, etc. Frequently the animal becomes dull and morose, and tries to hide away alone under furniture and in other out of the way places, then for a time becomes again lively and affectionate. Food is taken at first, if in a form that can be swallowed without chewing, but difficulty in swallowing is an early symptom. Next the dog may leave home and wander aimlessly along often for many (30 to 40) miles. If his attention is attracted by animals or people, he is liable to bite them; otherwise he passes on without paying any attention to things around him. Later stiffness of the legs and general paralysis set in, death following in from one to 10 days after the first symptom. Larger animals show much the same symptoms as dogs as far as their habits let them, restlessness, loss of appetite, a sort of insanity, paralysis, and convulsions often being seen.

In dumb rabies the jaw muscles are paralyzed almost from the beginning. A dog so affected is less dangerous than one with the furious form, simply because he is unable to bite. However, the "mad dog" that is talked about and so greatly feared does not often attack people or animals if his attention is not directed toward them.

Treatment for People and Animals

While the disease is usually fatal, all persons bitten by rabid dogs do not develop it. Reports show that only from 10 to 20 per cent of those bitten on the hands or feet contract rabies, though from 50 to 80 per cent of those bitten about the face or neck do. A method of vaccinating people that have been bitten by a rabid animal to prevent fatal results, discovered by Pasteur of France, is recognized as a valuable and usually successful preventive if applied promptly after a person is bitten.

In the case of animals there is no cure or treatment except the Pasteur vaccination as in man. If a person is bitten by a dog which it is thought may be rabid, have a doctor treat the wound, and tie the animal up and watch it carefully for definite symptoms; or kill it and send the head to a laboratory to be examined for definite signs of the disease. In most states such laboratories are connected with the departments of health or agriculture, the live stock sanitary board, or the agricultural experiment station. In any case the nearest of these agencies can tell what course to pursue. If the dog's stomach contains little or no food, but bits of wood and other unusual objects suggesting an abnormal appetite, there is a good chance that it had the disease. In the case of serious outbreaks, strict quarantine and prompt destruction of rabid animals are the only effective measures.



FARM KNOWLEDGE

PART III



Animal Products

HAVING told how to care for animals in health and treat them in sickness, there remains the problem of how to make them profitable. In most cases this depends upon the handling, use, and disposal of their products. Formerly most farmers were not only producers but distributors, wholesalers, and retailers as well. They sold their surplus products to consumers within easy reach; but to a larger extent they tried to supply themselves and their families with the necessities of life and to keep their farms self supporting. To-day, with improved shipping facilities, increased city populations, concentrated market conditions, the increased use of canned goods, and higher standards of living in general, the bulk of the average farm's output is sold to a middleman and immediately carried out of touch with the farm; that is, the handling and final use of the products are taken over by others than the farmer himself. At the same time it is highly desirable (1) that the farm raise as much as possible of the food its inhabitants—both humans and animals—consume; and (2) that even if he is not directly concerned, the farmer should know how animal products are handled and marketed under modern conditions. Thus the remaining chapters of this volume discuss the handling of these products both on the farm and off, except eggs and poultry which have already been covered in Part I.—EDITOR.

CHAPTER 40

Milk and Its Products; Dairy Industry Statistics

By PROFESSOR E. H. FARRINGTON, of the Dairy Husbandry Department of the University of Wisconsin, where, since 1894, he has been studying the problems of the dairy industry and telling practical farmers about them. His previous experience along dairy lines was obtained at the University of Maine, the Experiment Stations of Connecticut and Illinois, and in the Office of Experiment Stations of the U. S. Department of Agriculture. He was also Chemist of the Dairy Tests at the World's Fairs of 1894 and 1903.

The practical dairyman may claim that his business is simply the making and selling of milk products, and that he is not interested in what they are made of, how they vary, etc. He will find, however, that it is just this sort of knowledge that will make him a better farmer, and his business more profitable. After all, every man who keeps cows is a dairyman, whether he has one or a hundred. That is, he must recognize certain principles, meet certain requirements and know certain facts upon which depend the health and the usefulness of any cow and every cow. This chapter discusses milk in relation to the more important of these facts.—EDITOR.

What Milk Is

MILK is a perfect food provided by nature to nourish young animals—including man—but highly valued also for the use of older ones. It contains all the important food elements, not only in the proportions that make for complete nutrition, but also in highly digestible, and therefore economical, form; also it contains substances called “vitamines” which are absolutely essential for the normal growth of young animals. Experiments have shown that the feeding of a ration containing no vitamins, but otherwise balanced, results in stunted growth and, sometimes, paralysis.

How milk is made. In the milk producing female, the blood and lymph vessels bring food materials to the udder where they are changed into two “glands” or masses of tissue.

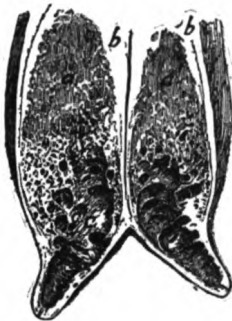


FIG. 490. Crosswise section of cow's udder. *a* Main part of milk-making gland; *b* fat and supporting tissue; *c* (below) sinuses or milk wells opening into teat cavities.

As soon as the act of milking begins these glands, built up since the last milking, begin to break down or “liquify” forming the milk, which flows down through passages in the fleshy part of the udder to the reservoirs or “milk cisterns” at the base of the teats, from which it is drawn by the pressure of the milker's hands. Milk is *not* held in the udder like water in a sponge or bag; only a part of what a cow will give at a milking is present, ready formed, when milking begins. Therefore, the amount she gives is not determined by the size of the udder, which may be largely muscle or fat, but by the activity of the glands which are located deep in the udder well up near the body. Of course, a large udder of the right quality suggests better milking qualities than an undersized one.

What controls milk flow. The female has some, but not entire control over this process of milk secretion; she cannot stop or start her flow at will and in many cases stubborn milkers do not “hold up” on purpose. However, her nervous system is closely related to her milk-producing

powers; gentle treatment tends to promote, and rough handling to retard, milk secretion; sudden excitement or a sharp attack of indigestion may affect not only the amount, but even the composition of the milk, though such changes usually give way to normal conditions as soon as the disturbing cause has passed. Other factors that influence the amount and composition of the milk flow, and that are more or less under the control of the farmer are discussed on p. 438.

There is a direct and very important relation between the activity of the milk glands and the production of offspring. Shortly after she gives birth to young, the milk flow of the cow is at its height. Naturally—in wild animals—this flow continues only long enough to give the young a good start in life, or until they are weaned. In the case of the cow, man has lengthened the milk-producing period and increased the yield in order to supply himself with this perfect food; this increased ability has now become a fixed characteristic of wellbred cows although, as mentioned, the treatment any particular cow receives may greatly affect its operation.

What Milk is Made Of

Milk is partly a solution (in which materials are *dissolved* in a liquid—like sugar in lemonade), and partly an emulsion (in which materials are held *in suspension* or float around in the liquid—like the finely broken oil globules in a salad dressing). Of the materials listed below, the milk sugar, albumen and part of the ash are in solution; the fat, casein and the rest of the ash are in suspension.

Water. About 87½ per cent of milk is water. This percentage, though large for a food, is less than that in some vegetables, such as beets with 88 per cent, turnips with 90 and pumpkins with 91. If all the water is evaporated from milk there are left the

Total solids, amounting to about 12½ per cent. These, of course, include the fat, sugar, casein, albumen and ash. If, however, the fat is first removed from the milk (by thorough separating) there is left the

Milk serum, representing about 97 per cent of the milk and consisting of the water, sugar, albumen, casein and ash. Skimmilk is mostly milk serum. If the water is evaporated from the milk serum, or if the fat is taken out of the dry total solids, there are left the

Solids-not-fat, which usually make up about 8½ per cent of the milk. This term is most used in calculations made to show how much milk has been skimmed or watered (p. 444). As a rule, a very low percentage of solids-not-fat indicates watering while a high one shows that the milk has been skimmed. Taking up the solids-not-fat in order, we have:

1. **Milk sugar (lactose)**, which is about one-third as sweet as ordinary cane sugar, does not dissolve as readily, and is in solution in the water. The usual amount is about 5 per cent. When certain bacteria, which are carried in the dust of stables, on cattle, in dirty pails, strainers, etc., get into milk, they begin to change the milk sugar into lactic acid, and the milk is said to "turn sour." This goes on until .8 per cent of acid is present after which the bacteria cannot go on working; thus even in sour milk some sugar remains un-

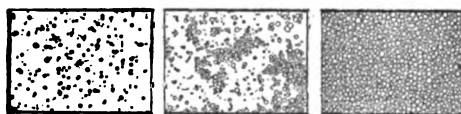


FIG. 491. Milk seen through a microscope, showing the fat globules floating in the serum. *Left*, skimmilk; *centre*, whole milk; *right*, cream. (Cornell Reading Course Bulletin II.—32).

changed. Since both the sugar and the acid contain the same amount of food elements, there is no difference in food value—as far as the milk sugar is concerned—between sweet and sour milk.

2. **Albumen** in milk is a substance rich in nitrogen, similar to white of egg or that part of the blood that clots; it makes up about 7 per cent of the milk and, like the sugar is dissolved in the water. In some ways albumen is like casein or curd, but it is coagulated (clotted) not by the action of acid, rennet or pepsin as is casein, but by heat—at 140 degrees F.; it is therefore left in the whey when cheese is made. It may be obtained by boiling sweet milk.

3. **Casein**, commonly called the "cheese constituent," is the white curd that separates when skimmilk sours. Cream cheese is about one-third casein, and cottage cheese nearly pure casein and water. This, like the albumen, is rich in nitrogen and of nearly the same importance as the fat, but it varies less in amount averaging about 2.5 per cent. The casein particles are so small that although not in solution, they cannot be seen even with a microscope, as the fat globules

can. They are separated from the rest of the milk and coagulated by rennet, pepsin and the acid that develops when milk sours but not by heat. When dried and ground casein is used in making glue, paints, imitation bone articles and for finishing fine writing papers.

4. *Ash.* The mineral matter in milk is composed mostly of phosphate, sulphate, chloride and carbonate salts of lime, soda and potash, with a little iron and magnesium, all of which materials are of great food value, especially for bone building. The difficulty of coagulating with rennet, milk that has been heated to 160 degrees or higher is thought to be due to changes brought about in the lime salts necessary for this process.

5. *Enzymes.* These are a form of nitrogenous substances resembling albumen. Though present in very small quantities they are very important in making dairy products more digestible. The improved flavor and greater digestibility of old cheese is due to their action on the curd in making it more soluble during the curing period.

The fat. This exists in milk in the form of very small drops or globules floating around in the milk serum, but which tend to rise to the surface when the milk stands quietly. They vary greatly in size, but in general are so small that 25 placed side by side will about equal the thickness of a sheet of paper, while a drop of milk the size of a pin head will contain from 1 to 5 million of them! Their size varies with the breed—Jersey and

THE COMPOSITION OF COWS' MILK

MATERIAL	AVERAGE PER CENT OF MILK	AVERAGE PER CENT TOTAL SOLIDS	EXTREME PERCENTAGES
Water . . .	88.00	—	83.0 to 91.0
Total solids	12.00	—	9.0 " 17.0
Fat . . .	3.60	30.00	2.0 " 8.0
Casein . .	2.60	20.80	2.0 " 4.5
Albumen .	0.70	5.00	0.2 " 1.3
Milk sugar	4.70	39.20	3.0 " 6.6
Ash . . .	0.70	5.00	0.6 " 1.0

Guernsey milk containing the largest globules, the dual purpose breeds the next in size and the Holstein and Ayrshire the smallest. This accounts for the different lengths of time required for the rising of cream in the milk of these breeds. The stage of the milking period also affects their size; they are largest when the cow freshens, smallest just before she goes dry. Difficult churning may be caused partly by small fat globules. This trouble is common on farms in winter because more cows are then nearly dry and because farm skimmed cream is often thin and often churned in a cold room.

The importance of fat. The money value of milk and cream is measured by the percentages of fat they contain; skimmilk is therefore the cheapest. The first milk drawn from a cow's udder at each milking is much thinner than the last—or "strippings"; except in fat content, however, it varies but little. The percentage of fat varies more than that of any other material in milk. A cow may give 2 per cent milk at one milking and 8 per cent at the next where abnormal conditions are present, and variations of 1 or 2 per cent are common. (This does *not* mean that the farmer by special feeding or other treatment can increase or decrease the percentage of fat in any cow's milk). Because of this difference it is no longer advised to feed babies on the milk of single selected cows; the mixed milk of several cows is likely to be much more uniform in composition from day to day. Milk fat is made up of several different fats which only the chemist can tell apart or separate. Butter can be distinguished from oleomargarine by the presence of one of these fats called *butyrin* which is not found in any other animal fat or oil in the same proportion as in milk or any of its products.

Different Kinds of Milk

Although cow's milk is by far the most important, the milk of some other animals is used for food in some countries. In southern France *sheep's milk* is used for making Roquefort cheese; in some countries sheep and goats supply nearly all the milk consumed, either whole or as butter or cheese. *Goat's milk* is somewhat richer than cow's milk. *Mare's milk* contains less fat but much more sugar than of most other animals; it is very white and has a peculiar flavor.

Woman's milk is high in sugar, not very rich, and low in casein but otherwise very similar to cow's milk.

Colostrum, the first milk formed after giving birth to offspring, contains a high percentage of albumen. It is yellowish, has a salty taste and changes rapidly in composition, until by about the sixth day, it is normal. Colostrum is provided by nature especially for the very young animal, but for human use, cows' milk is not generally considered safe until after the fifth day after calving.

COMPOSITION OF MILK OF DIFFERENT MAMMALS

(REPORTED BY RICHMOND)

MILK OF	WATER	FAT	SUGAR	CASEIN	ALBUMEN	ASH
Cow	87.10	3.90	4.75	3.00	.40	.75
Goat	86.04	4.63	4.22	3.49	.86	.76
Ewe	79.46	8.63	4.28	5.23	1.45	.97
Mare	89.80	1.17	6.89	1.84		.30
Sow	84.40	4.55	3.13	7.23		1.05
Woman	88.20	3.30	6.80	1.00	.50	.20

City milk laws usually forbid the sale of milk also for at least 15 days *before* calving. If milk is used for cheese making too soon after calving, the rennet does not act normally and the cheese has an unpleasant flavor; colostrum milk does not, however, affect the flavor of butter as the abnormal materials pass off in the buttermilk.

Colostrum milk may be detected by examination with a microscope and by boiling; if sweet milk is heated to boiling and a clot or cake separates, it is probably from a cow too near the calving period.

The following figures show how milk changes during the first days after calving:

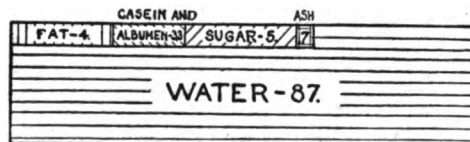


FIG. 492. Percentages of different materials in whole milk of average quality or better

TIME AFTER CALVING	TOTAL SOLIDS	FAT	CASEIN	ALBUMEN	SUGAR	ASH
At once	26.83	3.54	2.65	16.56	3.00	1.18
24 hours	19.37	4.75	4.50	6.25	2.85	1.02
48 hours	14.19	4.21	3.25	2.31	3.46	0.96
72 hours	13.36	4.08	3.33	1.03	4.10	0.82

How Cow's Milk Varies and Why

The milk of different breeds. The cows of each of the 5 so-called "dairy breeds" produce milk of characteristic composition, although, of course, single animals in any breed vary from the average. The following figures show average yields and the average quality (richness) of milk for different breeds, including both dairy and other types.

AVERAGE COMPOSITION OF MILK OF PUREBRED COWS (WOLL)

BREED	NO. OF COWS	AVERAGE DAILY YIELD LBS.	NO. OF COWS	AVERAGE PER CENT FAT
Jersey	153	24.5	164	5.13
Guernsey	53	28.9	67	4.87
Holstein-Friesian	493	48.9	502	3.30
Ayrshire	18	27.7	33	3.85
Brown Swiss	14	37.3	14	3.77
Red Polled	15	26.6	15	3.84
Shorthorn	39	31.9	43	3.58
Dutch Belted	5	27.2	5	3.40
Devon	25	11.8	28	4.64

contrast in milk and fat production between the best cows and the "average cow" which supplies the mass of our milk supply but which produces per year only about 4,000 pounds of milk and 150 pounds of butter fat! These records also show that the milk of the best cows in any one breed varies widely in fat content, that of Holstein No. 2, which has the best milk record, being a trifle richer than that of Jersey No. 2.

Conditions that Influence Milk Production and Composition

The treatment cows receive in the stable, pasture, and barn yard, has a great influence on their milk production. A cow is a much more sensitive animal than a steer or other farm animal; her one business is to convert her feed into milk and she needs all her strength for that purpose.

The cow's temperament influences the extent to which her milk flow is changed by disturbing conditions. A cow with a quiet disposition will give milk of a uniform richness from day to day, while a high strung, nervous animal may show great changes from one milking to another. This often explains sudden peculiar changes in income when milk is sold "by the test." The farmer naturally expects that so long as he is feeding, milking, and stabling his cows the same way from day to day, the richness of the milk will remain the same, and he is inclined to think that a report from the milk buyer showing a change in test is the result of careless testing, or the use of an inaccurate method. The best way to become convinced of this natural variation in the milk of some cows is to test (p. 443) samples from each milking for a month or more and compare the results.

The health of the cow may be often judged by sudden changes in the test of her milk. A sudden rise in test usually indicates a feverish, "off feed" condition. Other sudden changes

The milk of exceptional cows. Since the use of the Babcock test (p. 443) became universal, the comparative merits of different cows as milk producers have been measured by the total pounds of butter fat found in their milk for a given number of days. Owners of large milking cows are continually competing for the "highest record" for a cow of a particular age, or any age, of a particular breed, or all breeds, etc. The most popular records at the present time are those covering periods of one week and one year.

The high marks for each breed are constantly changing. Some recent records, as given below, show the great

YEARLY MILK RECORDS OF 2 PUREBRED COWS IN EACH OF 5 BREEDS

BREED	COW	MILK LBS.	FAT PER CENT	FAT LBS.
Holstein	{ 1	27,761	4.3	1,205
	{ 2	30,451	3.1	951
Guernsey	{ 1	24,008	4.5	1,098
	{ 2	17,285	5.2	910
Jersey	{ 1	17,557	5.6	991
	{ 2	19,694	4.2	839
Ayrshire	{ 1	22,596	4.2	955
	{ 2	25,329	3.5	894
Brown Swiss	{ 1	19,461	4.1	798
	{ 2	16,804	4.3	727

have been traced to a cow breaking loose in the stable at night and creating a general disturbance, while the effects on the milk flow of exposure to a cold rain storm and of being chased by dogs have repeatedly been noticed. Such changes in the case of valuable cows demand an immediate, thorough, expert search for the cause.

The milking period. The time between calving and "going dry" is called the *lactation period*. As a rule the cow gives the most

and thinnest milk at the beginning and the least and richest milk near the end of this period. The variation may be considerable, some cows giving at the end milk nearly twice as rich as at the beginning; in others the increase may not be more than 1 per cent. The average figures from the records of 1,300 cows show a milk test for the first month of 3.7 per cent fat; third month 3.5 per cent, and last month of the lactation period 4.2 per cent fat.

The length of the lactation period is an important factor in a cow's value. The tendency to persistently give milk is influenced by the inherited milking characteristic, the way a cow is milked, and the time of the beginning of the next milking period. The average lactation period for over 600 cows was found to be about 300 days.

Changes associated with the lactation periods of 2 cows are illustrated by the following records:

DAILY YIELDS AND TESTS DURING ONE LACTATION PERIOD

MONTH	1st	2d	3d	4th	5th	6th	7th	8th	9th	10th
Cow milk (lbs.)	23	19	17	20	19	17	16	13	8	3
I Fat (per cent)	4.5	4.6	4.7	4.9	4.6	4.9	5.4	5.7	6.3	6.4
Cow milk (lbs.)	26	30	31	27	23	23	20	16	12	6
II Fat (per cent)	3.6	3.9	3.5	3.6	3.5	3.4	3.5	3.8	4.1	4.3

"Fore" milk and "strippings." The difference in richness of the first and the last quart of milk at any one milking is very striking as shown by the following figures for three different cows:

	COW A	COW B	COW C
Milk yield in lbs.	40	28	40
Per cent of fat in first quart	1.4	1.8	.8
Per cent of fat in last quart	7.4	4.3	6.4

Morning's and night's milk. There is much difference of opinion as to which is richer, the night's or the morning's milk. The true answer depends entirely on the number of hours between milkings. In summer, cows are usually milked around 7 P. M. and early in the morning, say at 5. The morning's milk will then be the richer because only 10 hours passed between milkings, while the night's milk, after a 14-hour period, will be the thinner. At other seasons when the cows are milked about 6 o'clock morning and night, the richness of the two milkings will probably be about the same.

Manner of milking. Fast milking is more acceptable to the cow than slow milking. Also some milkers always obtain more and richer milk than others. In a trial made to test this point, a man styled "good milker" obtained about 18 pounds of milk testing 4.2 per cent fat, while a so-called "poor milker"

obtained about 12½ pounds testing 2.7 per cent fat from the same cow. Another milker's records showed 244 pounds more milk from 5 cows during a 2 weeks' trial than a so-called "poor milker" got from the same cows in another 2 weeks' period. As long as the cow takes kindly to the milker and the milking is done in a rapid, business-like way, the milk secreting glands develop, but any rough treatment that causes the cow to dread the milking process tends to reduce both the amount and the quality of the milk she gives. Milking the cow dry each time also helps to promote milk secretion; one of the surest methods of drying up a persistent milker is to leave her about half milked each time until she gradually stops giving milk.

Change of surroundings. When a cow is transferred from one stable to another, a change in both the amount and richness of her milk is frequently noticed for a few days. In taking cows to state or county fairs, dairy shows, etc., the transfer in box cars, the excitement of driving them along the street, and the new stalls at the exhibition, all have an effect, generally an injurious one, on their milk flow.

Number of milking periods. The number of years a cow will produce profitably depends (1) on her individuality, and (2) on the treatment she is given each year, but there is, of course, a limit. She is supposed to reach her maximum milk production at about 5 years of age but a study of over 2,400 records has shown an increase in the annual milk production up to the seventh lactation period. After this time there is usually a slight but steady decline and very few cows are milked up to the age of 10 years.

Milk Products

Cream is simply very rich milk, in which the proportion of fat has been increased by the removal of part of the liquid contents, either by setting and skimming or by the action of a separator (p. 454). It may contain from 15 to as much as 60 per cent of fat, depending on how thoroughly the skimming or separating is done. *Ice cream* is the result of stirring or beating sweet cream (or a cooked custard of cream, milk, eggs, etc.) carrying some flavoring

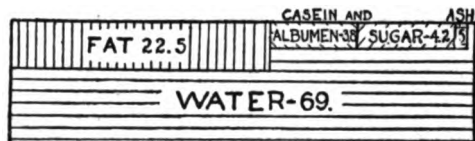


FIG. 493. Percentages of materials in average cream

crushed ice or brine. As far as the composition and food value is exactly the same as in the unfrozen product. Some ice cream manufacturers mix sweet butter with skimmilk and force it through a special machine to distribute the fat. Thus they save freight on the moisture in fresh cream and lessen the chance of its spoiling.

Milk of average quality will produce, per 1,000 pounds, about 145 pounds of cream and 850 pounds of skimmilk (a loss of 5 pounds in the form of slime, etc. occurring in the separator). The 145 pounds of cream will make about 42 pounds of butter, leaving 100 pounds of buttermilk, 3 pounds being lost in the process.



FIG. 495. Percentages of materials in butter

whole milk, and since these materials are especially needed by growing animals, it has a food value that is not as fully appreciated as it should be.

Butter (Chapter 43) consists of the fat particles collected and worked into a compact mass from which most of the liquid and the other milk solids have been removed. It should contain at least 80 per cent fat, the rest being water, and, roughly, 1 per cent curd and milk sugar, and 3 per cent salt.

Buttermilk is the liquid (serum) that remains when the fat in ripened or sweet cream, collected by churning, is removed as butter. It resembles skimmilk but varies more in composition. On the average 91 per cent is water, 4 per cent casein and albumen, 4 per cent milk sugar (and lactic acid), .3 per cent fat and .7 per cent ash.

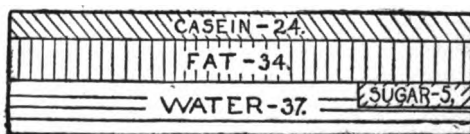


FIG. 497. Percentages of materials in cheese

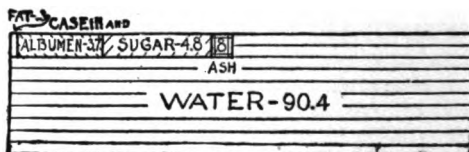


FIG. 494. Percentages of materials in separator skimmilk

Skimmilk is the milk serum with what little fat is left after the skimming or separating operation. Since it is just as rich in casein and albumen as

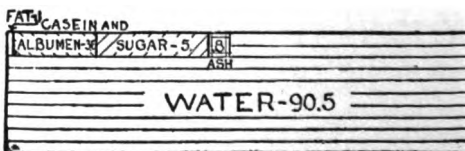


FIG. 496. Percentages of materials in buttermilk

Cheese (Chapter 44) consists of clotted, pressed and more or less ripened casein or curd, fat, and water. In cheese fresh from the press the percentages of these are 24, 34, and 37; the remaining 5 per cent is made up of

sugar, acid, and salt. In curing some water is lost.

Whey is the liquid by-product of cheese making, consisting of about 93 per cent water, 5 per cent sugar, .8 per cent albumen, .6 per cent ash and .3 per cent fat. It is used for feeding stock and in the making of milk sugar and of whey cheese.

FAT-5
SUGAR-5
ASH
CASEIN AND ALBUMEN
WATER-93.2

FIG. 498. Percentages of materials in whey

Condensed milk is whole or partially skimmed milk from which part of the moisture has been evaporated. Some brands are canned with no other change and these are usually sold as evaporated milk; others contain 25 per cent or more sugar which is added to improve their keeping quality. The Food and Drug Law holds that condensed milk must contain at least 25½ per cent solids, of which at least 7.8 per cent is fat.

Dried milk or milk powder consists of the solids of whole or skimmilk from which practically all the moisture has been driven off by some mechanical process. The resulting fine white powder can be added to water to form milk of any desired richness, or it may be used in home or commercial cooking in dry form, being mixed with flour, etc. before any liquids are added.

Casein, as already mentioned (p. 435), has a definite value in various industries and is prepared and handled on a commercial scale.

Standards and Tests for Milk Products

Why test milk? The testing of milk products benefits both the producer and the consumer. As already pointed out the value of milk (and to some extent that of the cow that gives it) depends mainly on its fat content. Only that farmer who knows how to test for the per cent of fat and *who does it* regularly can know whether a cow is paying her way, whether he is getting a fair price for his milk, whether he is wasting valuable fat in the skimmilk, etc. The larger the business the wider the usefulness and the greater the value of such a test.

Secondly, the laws of most states and cities as well as certain rulings in the Food and Drug Law establish standards up to which all milk products sold must measure. Only by means of tests can boards of health, departments of agriculture, or even individual consumers be sure whether the milk supplied for human consumption is lawful in composition, cleanliness, freedom from disease germs, etc. Again, milk may be so easily skimmed, watered or contaminated that it has been found desirable and necessary to invent methods by which to determine the food value and purity of any lot of milk. Some of the commoner and simpler tests are described below.

What is good milk? This question is answered differently by different boards and authorities and the farmer who plans to sell milk or any milk product, wholesale or retail, should find out from the nearest source the standards for his locality. These may

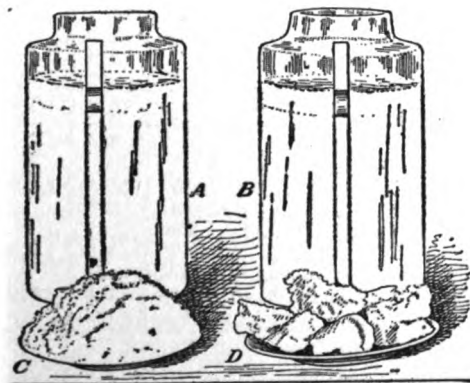


FIG. 499. Milk powder and its product. *c* shows a plate full of the dried milk; *a* a glass of liquid milk prepared from it; *b* a glass of ordinary milk; *d* butter made from the cream rising in (*a*). Note the depth of this cream in both glasses. (Cornell Countryman, Volume 6, page 240)

LEGAL STANDARDS FOR IMPORTANT DAIRY PRODUCTS
(BUREAU OF ANIMAL INDUSTRY, 1916)

STATE	MILK			SKIM MILK	CREAM	BUTTER		WHOLE MILK	ICE CREAM	
	TOTAL SOLIDS	SOLIDS NOT FAT	FAT	TOTAL SOLIDS	FAT	FAT	WATER	CHEESE FAT	PLAIN	FRUIT AND NUT
Ariz.	Federal	stand	ards.	Ice crea	m fillers	may be	used if	so annou	nced	
Cal.		8.5	3.0	8.8	18.0	80.0		² 50.0	10.0	8.0
Colo.			3.0		16.0	80.0	16.0		14.0	12.0
Conn.	11.75	8.5	3.25		16.0	³	³			
D. of Col.	12.5	9.0	3.5	9.3	20.0	83.0	12.0	⁴		
Fla.		8.5	3.25	9.25	18.0	82.5			12.0	
Ga.		8.5	3.25	9.25	18.0	82.5	16.0	³	12.0	10.0
Hawaii	11.5		2.5		18.0					
Ida.	11.2	8.0	3.2	9.3	18.	82.5	16.0	² 50.0	14.0	12.0
Ill.		8.5	3.0	9.25	18.0	82.5		² 50.0	8.0	8.0
Ind.		8.5	3.25	9.25	18.0	82.5	16.0	² 50.0	8.0	8.0
Ia.	12.0		3.0		16.0	80.0			12.0	10.0
Kan.			3.25		18.0	80.0	16.0	² 50.0	14.0	12.0
Ky.		8.5	3.25	9.25	18.0	82.5		² 50.0	14.0	12.0
La.		8.5	3.5	8.0	³	³	³	³	10.0	8.0
Me.	11.75	8.5	3.25		18.0			² 50.0	14.0	12.0
Md.	12.5		3.5	9.25	18.0				4.0	6.0
Mass.	12.15		3.35	⁵ 9.3	15.0				7.0	7.0
Mich.	12.5		3.0		18.0	80.0		² 30.0	10.0	8.0
Minn.	13.0	9.75	3.25		20.0		16.0	² 45.0	12.	12.0
Mo.	12.0	8.75	3.25	9.25	18.0	82.5		² 50.0	14.0	12.0
Mont.	11.75	8.5	3.25		20.0	82.5	16.0		12.0	10.0
Neb.			3.0		18.0				14.0	12.0
N. H.	12.0			8.5	18.0	80.0	16.0	³	14.0	14.0
N. J.	11.5		3.0	9.25	16.0	82.5		² 50.0		
Nev.	11.75	8.5	3.25	9.25	18.0	82.5	16.0	² 50.0	14.0	12.0
N. Y.	11.50		3.0		18.0					
N. C.	11.75	8.5	3.25	9.25	18.0	8.25		² 50.0	10.0	8.0
N. D.	12.0		3.0		15.0	³	³	³	14.0	12.0
O.	12.0		3.0					⁷		
Ore.	11.70	8.5	3.2		18.0	80.0	16.0	30.0	12.0	9.0
Pa.	12.0		3.25	³	18.0	³	³	32.0	8.0	6.0
P. I.	11.75	8.5	3.25	9.25	18.0	82.5		² 50.0	14.0	12.0
R. I.	12.0		2.5			82.5		² 50.0	8.0	8.0
S. D.		8.5	3.25	9.25	18.0	80.0		² 50.0	14.0	12.0
Tenn.	12.0	8.5	3.5	9.0	20.0	82.5	15.99	² 50.0	8.0	7.0
Tex.	12.0	8.5	3.25	9.25	18.0	82.5		³	8.0	6.0
Utah	12.0	8.8	3.2		18.0	80.0	16.0	30.0	³	³
Vt.	11.75	8.5	3.25	9.25	18.0	82.5		30.0	14.0	12.0
Va.		8.5	3.25	9.25	18.0	82.5	16.0	² 50.0	8.0	8.0
Wash.	12.0	8.75	3.25	9.3	18.0			30.0		
Wis.		8.5	3.0	9.0	18.0	82.5		² 50.0	14.0	12.0
Wyo.	Federal	standa	ards.							
U. S.		8.5	3.25	9.25	18.0	82.5	16.0	² 50.0	14.0	12.0

²Fat based on total solids.

³Federal; U. S. standard

⁵Solids in fat

⁷Full cream 30. Standard 21.

⁴U. S. Food and Drug Law of 1906 applies to Dist. of Columbia.

involve any or all of the following: number of bacteria contained; per cent of fat; per cent of total solids; freedom from adulteration; pasteurization; type of container used; conditions found and methods used at the farm and in the dairy; temperature of milk when shipped; and any other factors that definitely influence the healthfulness of the product.

The farmer who supplies milk to those outside his family carries, therefore, a legal responsibility; the law through its proper officers can set the standard for his product and insist that he live up to it. But more than this the farmer who supplies milk or any other food whether to his own family or to others, bears in addition a moral responsibility which he may not see expressed in the form of inspectors and reports, but which makes it no less necessary that he keep his milk pure and of the right quality.

The Babcock Test

This is a means of finding the per cent of fat in milk, skimmilk, buttermilk, condensed milk, cream, ice cream or cheese, the operation for any two materials differing only in the lesser details. It was perfected by Dr. S. M.

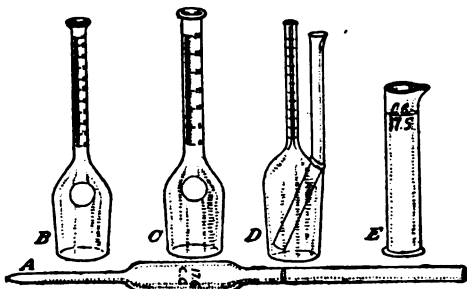


FIG. 500. Glassware used in making Babcock test. *a* pipette; *b* milk test bottle; *c* cream bottle; *d* skimmilk bottle; *e* glass acid measure.

Babcock of the University of Wisconsin in 1890 and it is interesting to note that no improvements have since been made upon the method as he first described it. The test is now universally used for figuring payments for milk and cream delivered to creameries, cheese factories and condenseries and, to some extent, to city milk dealers who buy milk by the 8- or 10-gallon can. It calls for a pipette or measuring tube, a glass measure holding exactly $17\frac{1}{2}$ cubic centimeters, a special long-

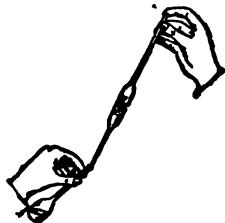


FIG. 501. How to use the pipette

necked test bottle, a machine in which 2 or more such bottles can be rapidly spun around, commercial sulphuric acid (oil of vitriol), some hot water and the sample to be tested.

How to test milk.
(1) Suck up into the pipette $17\frac{1}{2}$ cubic centimeters of the well-

mixed sample, close the top with one finger to prevent its running out, insert the end of the tube into the test bottle, lift the finger and let the milk run down the inside of the neck; blow gently so none of it is lost. (2) Measure out (not with the pipette) $17\frac{1}{2}$ c. c. of the acid and pour it carefully into the bottle, along the neck; it will form a layer below the milk. (3) Hold the bottle by the neck and swing it around for 2 or 3 minutes to mix the milk and acid, taking care not to spatter them about. The mass will become dark brown and hot, showing that the acid has broken the milk down and dissolved all the solids *but the fat*. (4) Immediately place the bottle or bottles (it is best to make two tests at the same time so you can check up the results) in the whirling machine or "tester" and whirl at the speed directed by its maker and usually marked on the handle, for at least 5 minutes. This separates the heavy black acid from the lighter, yellowish fat which is now seen at the top of the bottle. (5) Carefully add enough hot water to bring this layer of fat into the



FIG. 502. Right way to pour acid into bottle



FIG. 503. Mixing milk and acid

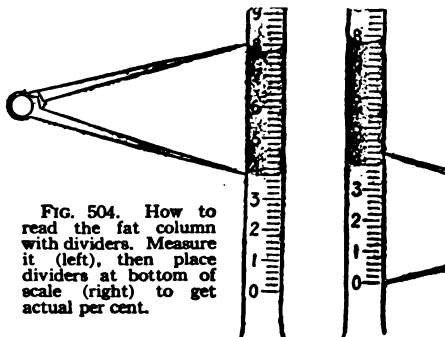


FIG. 504. How to read the fat column with dividers. Measure it (left), then place dividers at bottom of scale (right) to get actual per cent.

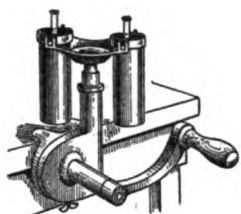


FIG. 505. Cheap but satisfactory Babcock tester for farm use.

neck by means of the numbered lines marked thereon. The graduations are so arranged that this gives the per cent of fat without

neck of the bottle and whirl again for 1 or 2 minutes. Even better results come from adding the water in 2 parts and whirling for a minute after each addition. (6) Remove the bottle, hold it level with the eyes and read the height of the column of fat in the further figuring. Do not wait till the fat cools and hardens. Read the length of the fat column between the lower line of fat and the top of it (Fig. 504).

Skim milk, buttermilk, and thin cream are tested in exactly the same way although for the first two a double-necked bottle with the graduated neck much smaller than the other, is needed for the accurate measuring of the small amounts of fat present.

How to test cream, condensed milk, and cheese. (1) Instead of measuring the sample with a pipette, weigh out a definite amount (between 9 and 18 grams) and put it in the bottle, keeping track of the exact amount. (2) Add enough clean water to make about 17 cubic centimeters in all, mix thoroughly and from here on proceed as directed for testing milk. (3) Read the column of fat as before (the neck of the cream bottle is larger and carries more divisions), multiply the figure by 18 and divide by the amount of the sample weighed out. The result is the per cent of fat.

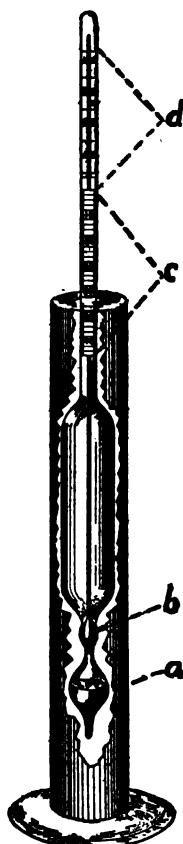


FIG. 506. Cylinder full of milk cut away to show lactometer in use. *a* bulb of mercury to give weight; *b* bulb of thermometer; *c* scale for reading specific gravity of milk; *d* thermometer scale. (Testing Milk—Farrington).

The Acidity Test

Several tests to show the extent to which the milk sugar has turned to lactic acid are in use (1)

to show the degree of ripeness of milk in cheesemaking and of cream in butter-making; and (2) to measure the slight degree of acidity of even sweet milk, which may affect its marketability. All of these require some standard solution of alkali which may be bought ready prepared or in the form of tablets to be dissolved in water.

How to make it. (1) Measure 17.6 c. c. of the sample into a white coffee cup with the pipette, as in the Babcock test. (2) Put the alkali solution in a graduated glass vessel and note the exact amount. (3) Pour this solution very slowly into the milk or cream, stirring gently until a slight pink color is seen. (4) Note the exact amount of alkali remaining and subtract this from the figure found under (2); the number of cubic centimeters used is the per cent of acidity. Fresh milk and cream will need but a very few drops for although rarely absolutely sweet, perfectly good milk usually contains only from .07 to .15 per cent of acid. After .3 or .35 per cent is present the sour or "turned" taste and odor are noticed. Cream ready for butter-making naturally tests much higher.

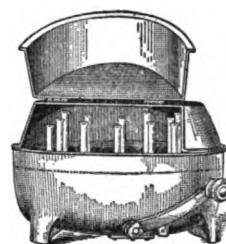


FIG. 507. Twelve bottle hand Babcock tester for large dairy farms.

Testing Skimmed Milk

The extent to which milk has been skimmed or watered may be estimated by using a *lactometer* (Fig. 506) which is a thermometer-like instrument weighted at the bottom so that it floats upright when placed in a deep vessel of milk or other liquid. The long, narrow neck is graduated, the figures marked on it standing for the last two figures of the *specific gravity* of the sample, that is, the density or weight of the sample as compared with that of water. For instance the specific gravity of water is 1; that of skim milk is about 1.036; that of cream (or watered milk) about 1.029, all being based on the relative amounts of materials in the milk that are heavier or lighter than water. The figures on the instrument in such cases would be 0, 36 and 29 respectively. To tell whether milk has been skimmed or watered get the lactometer reading; if it is high, skimming may be suspected; if low, the milk *may* be rich in fat. But if the Babcock test shows that it is not rich, the low specific gravity must be due to the addition of water. In most states the legal standards for whole milk are 3 per cent fat and lactometer reading 32; the quality of the sample may be judged by its variation from these figures. Full directions



FIG. 508. Sediment tester in use (a), and separate from bottles to show construction b

for use accompany each instrument or may be had from the manufacturer.

The Milk Sediment Test

This test, designed to show the amount of dirt or sediment suspended in a sample, has up to the present been used only for sweet milk and cream. The apparatus consists of a metal cylinder about 2 inches in diameter and 6 inches long, in the bottom of which is a flat

piece of copper pierced with many small holes; the top is fitted with a cover and a rubber bulb which when squeezed forces a sample of milk placed in the cylinder through a filter or disc of cotton placed over the metal plate at the bottom. The cotton filter is so fine and dense that all the sediment in the sample is collected on its surface. It can then be removed and the cleanliness of the milk judged by the amount and character of the dirt. The discs so obtained by city milk plants, etc., are sometimes pasted on postal cards and sent to the producers to show what sort of milk they are supplying. Some plants use this test as a partial basis for payments, decreasing the price as the amount of sediment increases.

The Hart Casein Test

This test is of considerable importance in cheesemaking. It is designed to show the amount of casein in milk (just as the Babcock test shows the amount of fat), and, therefore, to give an idea of how much cheese can be made from any lot of milk. But since cheese is only about one-third casein while butter is about four-fifths fat, the casein test is less important and less widely used than the Babcock test. Also it must be done *very* carefully if correct results are to be obtained. To make it: (1) Measure 5 c. c. of the sweet milk at a temperature of 70 degrees F. into a casein test bottle. (2) Add 2 c. c. of chloroform and 25 c. c. of .25 per cent acetic acid and shake the bottle for about 15 seconds. (3) Place in a whirling machine (that can make 2,000 revolutions per minute) and whirl for 8 minutes. (4) Remove bottles, let stand for 10 minutes then read the percentage of casein as it stands in the neck of the bottle.

The Wisconsin Curd Test

This makes it possible to locate the particular lot of milk that causes defects in cheese when a number of farmers make up the source of supply. The only apparatus needed is a tin box about a foot square and 10 inches deep, and a thoroughly cleaned, sterilized pint glass jar for each lot of milk to be tested.

(1) Put about half a pint of milk from each lot in a jar, stand the jars in water in the tin box and heat the water to about 98 degrees F. (2) Add a few drops of rennet extract to each jar and mix well by swinging with a circular motion. (3) When the milk curdles, let the curd stand for about 20 minutes, then cut it fine with a case knife and stir it now and then for the next half hour. (4) Pour off the whey and keep on doing so as fast as more separates from the mat of curd, keeping the jars in the water and the water at 98 degrees all the time. (5) When the curd has stood about 6 hours take it out, cut it open and examine its solidity. If it has a spongy texture it shows that the milk was polluted and would not make good cheese; if it is solid and firm, it indicates clean cans and a good milk from which good cheese may be expected.

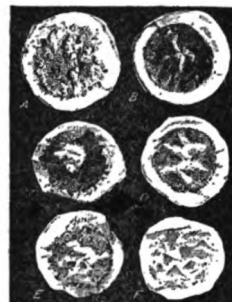


FIG. 509. Sample discs from sediment tester; a and b show dirt from two pints of strained and unstrained milk at the farm; c and e show dirt collected from milk taken in an open pail; d and f show dirt taken from milk in a small topped pail. (Wisconsin Circular—41).

The Rennet Test

This is used in cheesemaking to determine the ripeness of the milk. It requires a special piece of apparatus consisting of a porcelain lined can holding about a quart and a 2 ounce glass bottle. (1) Fill the bottle with water up to the neck and add 1 c. c. of rennet extract. (2) Fill the can with milk up to the zero point marked on its wall. (3) Pour the contents of the rennet into the milk and mix thoroughly. (4) Remove the stopper in the bottom of the can so that the milk flows out until the curdling action of the rennet stops it. The riper the milk the sooner it curdles and the smaller the amount that flows out. (5) Read the height of the milk in the can when the flow stops; this indicates the ripeness of the milk and with this knowledge the cheesemaker can tell what proportion of rennet he must add to the lot of milk of which he has just tested a sample.

The Dairy Industry in the United States

"The profits of agriculture ultimately depend on the intelligent cultivation of the soil and the preservation of its fertility. Dairy farming is increasing in almost every section of the country, largely because it is the most economical form of agriculture so far as soil fertility is concerned. A ton of butter removes from the soil less than a dollar's worth of fertilizing elements. Dairying also is growing because dairy products are an important part of our food supply. Opportunities for dairying are found in every agricultural district. The different sections of the country have characteristic peculiarities, but all need milk and its products." —D. F. Houston, Secretary of Agriculture.

While the dairy industry has long been one of tremendous proportions, it is probably greater to-day than ever before. Roughly speaking it involves nearly

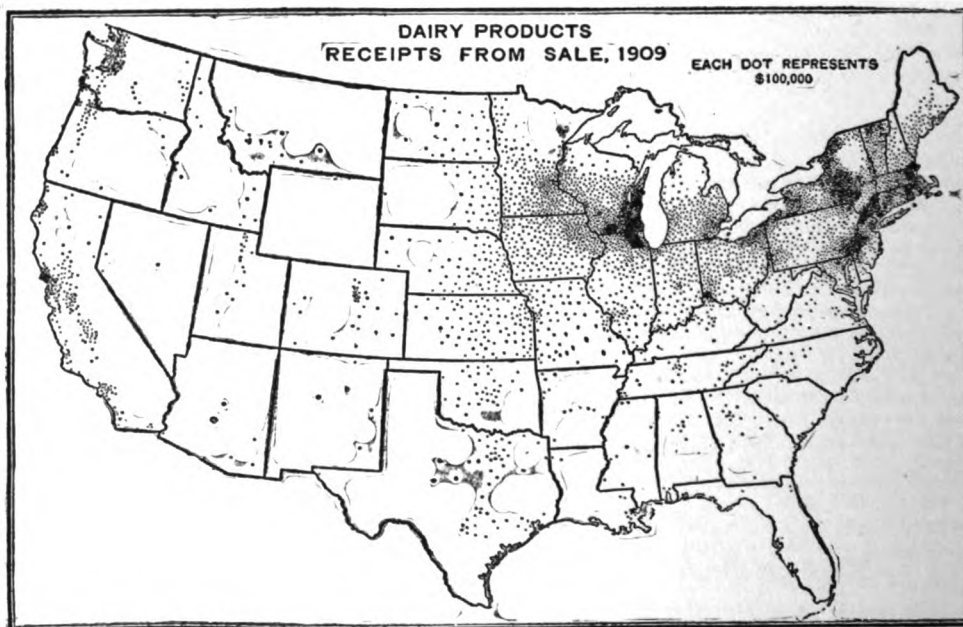


FIG. 510. Map showing where the greatest receipts from dairy products are obtained. Note the importance of dairying around the large cities and in the famous sections of central New York, Wisconsin, and northern Illinois. (1915 Yearbook U. S. Department of Agriculture).

23 million dairy animals worth nearly a billion and a half dollars; an annual output of at least 600 million dollars' worth of products; an export trade of over 24 million dollars in 1916; and, most vital of all, a very large share in the feeding of the nation's families and especially its children.

It is an industry of a great many related factors and intermingled activities, the extent of each of which cannot possibly be estimated. At the very foundation, of course, stands the *cow*—the milk producing machine, a machine with which scientists and practical breeders are doing wonderful things and getting wonderful results. The cow standard is higher than it ever has been, but lower than it undoubtedly is going to be.

Behind the cow come the *breeder* and the *dairyman*, one the creator or developer, the other the operator of this wonderful milk making machine. Both of these control to some extent the cow's surroundings, her *environment* which

LEADING STATES IN THE DAIRY INDUSTRY

IN SALES OF DAIRY PRODUCTS (1909)	IN NUMBER OF MILCH COWS (1917)	IN NUMBER OF CREAMERIES (1914)	IN NUMBER OF CHEESE FACTORIES (1914)
N. Y. \$ 74,939,815	Wis. \$ 1,750,000	Minn. 848	Wis. 1,720
Wis. 51,238,399	N. Y. 1,539,000	Wis. 812	N. Y. 995
Pa. 38,363,882	Ia. 1,405,000	N. Y. 576	Mich. 196
Ill. 26,720,849	Minn. 1,302,000	Iowa 562	Ohio 111
Iowa 26,429,743	Tex. 1,175,000	Pa. 445	Pa. 106
Ohio 25,574,635	Pa. 980,000	Ohio 307	Cal. 93
Minn. 25,214,222	O. 950,000	Mich. 273	Minn. 74
Mich. 22,099,178	Kan. 900,000	Ill. 216	Ill. 50
Cal. 19,083,297	Mo. 845,000	Vt. 181	Ore. 42
Mass. 14,840,927	Ind. 706,000	Cal. 152	Vt. 35
U. S. \$473,769,412	U. S. \$22,768,000	U. S. 5,463	U. S. 3,520

is the third factor; but this is made up of many details—buildings, silos, equipment, milking machinery, feed, care, etc. The field of *dairy products*, already surveyed, is the fifth factor and brings in a whole range of industries and workers that handle them. *Organization* is playing a great part in the dairy industry, no less in connection with marketing than with transportation, cow testing, bull ownership, cheesemaking, buttermaking, etc. Breeders of dairy cattle have long been organized—with results too well known to call for special mention; at last the producers, too, are organizing to meet and overcome a tyranny of price conditions that make dairying difficult if not impossible. *Legislation* in regard to and in behalf of dairying is being systematized, improved, made more effective. And all the time *research* and *teaching*—the discovering of facts and the telling and explaining of them to the farmer and dairyman—are progressing along constantly broadening roads into wider and wider fields of opportunity and productive effort.

It is not to be understood that the dairy industry is all that it can or should be. The widespread movement for a greater use of dairy products—and of course greater production—is based on their great and economical food value, which is gradually becoming better and better known. The best balance between demand and supply has not yet been attained. Cheese making offers opportunity for far greater activity. In 1870 our cheese exports reached 57 million pounds, our imports were only 2½ million pounds; by 1914, exports had gradually shrunk to less than 2½ million pounds, and imports had risen to 64 million! There is opportunity and *need* for the development of this phase of the industry. Perhaps no one factor will play a larger part in the growth of this and other lines of dairy production than organized community effort. Already its effect on dairying in many sections has been immense. The accompanying tables give some idea of the extent, distribution, and tendencies of the nation's dairy business.

DAIRY PRODUCTS TRADE OF THE UNITED STATES

	1917 EXPORTS		1917 IMPORTS	
	QUANTITY	VALUE	QUANTITY	VALUE
Butter, pounds	26,835,092	\$ 8,749,170	523,573	\$ 192,767
Cheese "	66,087,213	7,430,089	14,481,514	4,465,633
Cream } "	259,102,213*	25,413,450	743,819*	666,267
Milk }				1,746,446
		\$49,406,984		\$7,071,113

*—mostly condensed

*—gallons



CHAPTER 41



The Care and Use of Milk on the Farm

By C. H. ECKLES, Chief of the Dairy Husbandry Division of the University of Minnesota, previously Professor of Dairying, University of Missouri; an authority who knows his subject thoroughly and also how to discuss it so that every reader or hearer understands it. He was born and reared on an Iowa farm and at present owns a farm which he operates on a partnership basis. From 1895 to 1918 he had charge of a large dairy herd including animals of 4 breeds. In 1902 he bought 4 registered cows for \$600 and in 16 years, without buying another female, had developed a herd of 43 valued at nearly \$15,000 in addition to selling stock for some \$12,500. Meanwhile he became well known as an author and lecturer on dairy subjects.—EDITOR.

MILK and health. Milk and dairy products form an important part of the food of every family, especially every farm family; to most farm families they are in addition a source of income. Their healthfulness, whether they are used on the farm or sold is a matter of great importance and should be carefully considered. A safe milk supply demands that (1) cows must be healthy; (2) milk must be handled by healthy people; (3) cows must be kept clean; (4) utensils must be properly cleaned; (5) milk must be thoroughly cooled.

The importance of healthy cows. Fortunately, there are but few diseases that need to be feared from the cow, the most important being tuberculosis (p. 390) which she may have without showing any outward symptom whatever. While the risk from using milk from a tuberculous cow is probably not very great in the case of adults, the danger to children is undoubtedly great. The only way to make certain is to make, or have a veterinarian make, the tuberculin test. Many cities now require that all cows supplying them with milk be tested; the farmer will do well to have his cows tested as a means of protecting his own family even if not required to do so by any market rule. Milk produced by cows suffering from garget, or that have recently had it, is also not considered a safe food for children.

Milk produced by cows suffering from garget, or that have recently had it, is also not considered a safe food for children.

Why milk should be handled by healthy people. Milk is not safe if drawn from the cow or handled by a person having tuberculosis or recovering from or coming down with typhoid fever, scarlet fever, or diphtheria. If a case of any of these appear on a farm, milk should not be sold therefrom as long as the disease is present. Many outbreaks of human disease, especially typhoid fever, have been traced directly to milk, for although the cow herself is never subject to this disease, the milk may carry its germs. Special care should be taken

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF ANIMAL INDUSTRY,
DAIRY DIVISION.

SANITARY INSPECTION OF DAIRY FARMS.

SCORE CARD.

Adopted by the Official Dairy Inspectors' Association.

Owner or lessee of farm _____
P. O. address _____ State _____
Total number of cows _____ Number milking _____
Gallons of milk produced daily _____
Product is sold by producer in families, hotels, restaurants, stores,
to _____ dealer _____
For milk supply of _____
Permit No. _____ Date of inspection _____, 191
REMARKS: _____

FIG. 511. One side of an official score card for dairy farms, of which the other side is shown on the opposite page. (Bureau of Animal Industry).

that the water used in washing dairy utensils is pure; that from a shallow well or pond is often dangerously contaminated by sewage or drainage, and should never be used.

Why and How to Keep Cows Clean

Statistics show that in the large cities one infant out of every five dies during its first year. Unquestionably this is largely the result of the use of poor milk containing dirt and impurities which enter during careless handling on the farm. Such milk is far more dangerous in the city than in the country because it cannot be consumed in as fresh a condition. Immense sums are spent by cities in supervising their milk supplies, but the farmer is no less concerned since he supplies the milk in the first place.

Most of the dirt which gets into milk comes from the cow's body during milking. Thus the first factor in the production of safe, desirable milk, butter, etc., is a clean cow; one with manure soiled thighs and flanks cannot be milked even by the most careful milker without contaminating the milk.

Milk is generally much cleaner in summer than in winter because the cows

are then on pasture or at least out of the stable. That a cow may be kept clean when confined in the stable part or all of the time, the stall must be of proper size and arrangement and a little time must be given to cleaning her before each milking. The worst possible arrangement from a sanitary standpoint is to stand the cow on a level floor with a manger so constructed that she has to back up in order to lie down. Here she drops manure when standing, then backs up and lies down in it. To prevent this there is nothing more practical than a modern type stanchion with

EQUIPMENT.	SCORE.		METHODS.	SCORE.		
	Perfect.	Allowed.		Perfect.	Allowed.	
COWS.						
Health.....	6		Clean.....	8		
Apparently in good health.....	1		(Free from visible dirt, &c.)			
If tested with tuberculin within a year and no tubercle bacilli are found, or if tested within six months and all reacting animals removed.....	5		STABLES.			
(If tested within a year and reacting animals are found and removed, 2.)			Cleanliness of stables.....	6		
Food (clean and wholesome).....	1		Floor.....	2		
Water (clean and fresh).....	1		Walls.....	1		
STABLES.						
Location of stable.....	2		Ceilings and ledges.....	1		
Well drained.....	1		Mangers and partitions.....	1		
Free from contaminating surroundings.....	1		Windows.....	1		
Construction of stable.....	4		Stable air at milking time.....	5		
Tight, sound floor and proper gutter.....	2		Freedom from dust.....	3		
Smooth, tight walls and ceiling.....	1		Cleanliness of bedding.....	1		
Proper stall, tie, and manger.....	1		Barrenyard.....	2		
Provision for light: Four sq. ft. of glass per cow.....	4		Clean.....	1		
(Three sq. ft., 2; 2 sq. ft., 2; 1 sq. ft., 1. Deduct for uneven distribution.....	1		Well drained.....	1		
Bedding.....	7		Removal of manure daily to 50 feet from stable.....	2		
Ventilation.....	1		MILK ROOM OR MILK HOUSE.			
Provision for fresh air, controllable fire system.....	3		Cleanliness of milk room.....	3		
(Windows hinged at bottom, 1; sliding windows, 1; other openings, 0.5)			UTENSILS AND MILKING.			
Cubic feet of space per cow, 500 ft. or more.....	3		Care and cleanliness of utensils.....	8		
Less than 500 ft., 2; less than 400 ft., 1; less than 300 ft., 0.5)			Thoroughly washed.....	2		
Provision for controlling temperature.....	1		Sterilized in steam for 15 minutes.....	3		
UTENSILS.						
Construction and condition of utensils.....	1		(Placed over steam jet, or scalded with boiling water, 2)			
Water for cleaning (Clean, convenient, and abundant.)	1		Protected from contamination.....	3		
Small-top milking pail.....	1		Cleanliness of milking.....	9		
Milk cooler.....	1		Clean, dry hands.....	2		
Clean milking suits.....	1		Udders washed and wiped.....	6		
MILK ROOM OR MILK HOUSE.						
Location: Free from contaminating surroundings.....	1		(Udders cleaned with moist cloth, 4; cleaned with dry cloth or brush at least 15 minutes before milking, 1.)			
Construction of milk room.....	2		HANDLING THE MILK.			
Floor, walls, and ceilings.....	1		Cleanliness of attendants in milk room.....	2		
Light, ventilation, screens.....	1		Milk removed immediately from stable without pouring from pail.....	2		
Separate rooms for washing utensils and handling milk.....	1		Cooled immediately after milking each cow.....	2		
Facilities for cleaning (Hot water, &c.)	1		Cooled below 50° F.....	6		
Total.....	40		(51° to 55°, 4; 55° to 60°, 2.)			
			Stored below 50° F.....	3		
			(51° to 55°, 2; 55° to 60°, 1.)			
			Transportation below 50° F.....	2		
			(51° to 55°, 1.5; 55° to 60°, 1.)			
			(If delivered twice a day, allow perfect score for storage and transportation.)			
			Total.....	60		

Equipment..... + Methods..... = Final Score.

Notes 1.—If any exceptionally filthy condition is found, particularly dirty utensils, the total score may be further limited.
 Note 2.—If the water is exposed to dangerous contamination, or there is evidence of the presence of a dangerous disease in animals or attendants, the score shall be 0.
 0-125

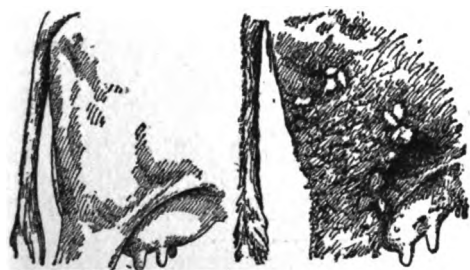


Fig. 512. It means very little more trouble to keep a cow in the condition shown at the left, but the difference in the cleanliness of the milk it yields can be imagined! If consumers could see the cows from which their milk comes, how much business would the owner of the cow at the right enjoy?

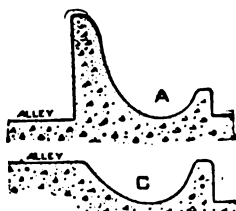


FIG. 513. Cross sections of common types of concrete mangers. The high front partition prevents the scattering of feed but makes it harder to keep the manger clean. (Wisconsin Bulletin 185).

the manger in front. Make the stall floor a platform of such length that the manure will drop in the gutter, which should be at least 8 inches deep. The proper length from the stallion to the edge of the gutter for average cows of different breeds is: Jersey, 54 inches; Guernsey, 56; Ayrshire, 56; Holstein, Shorthorn, and Red Poll, 60.

Before milking, brush the cows with a stiff brush, removing any manure that sticks to the hair with an ordinary curry comb. Very little attention each day will keep the cows in reasonably good condition. Where extra precautions are taken as in the production of high class sanitary milk, the udders and surrounding parts are washed and dried before milking.

Milking and Clean Milk

Milking is generally but mistakenly considered a simple operation that any common laborer can perform. One of the most difficult tasks in dairy farming is getting the milking done right. One man will often get a fourth more milk than another; one may dry up a cow within a few months, while another may keep her in milk the entire year. The farmer should select his help for this work as carefully as possible and at once take pains to instruct them how to do it *right*.

The milker must not excite or worry the cows by loud talking or abuse of any kind. Change milkers as little as possible, for every change results in some loss unless the new milker is more competent than the old. Wetting the hands with milk or by any other means is a filthy habit that should not be tolerated. It is bound to wash dirt from the hands and teats into the milk, and during cold weather the teats often chap and crack as a result of the practice. Most cows can be milked just as well dry; in the few exceptions a small amount of vaseline will serve the same purpose as water and is not open to any serious objections.

A cow should be milked quickly and quietly. If used to being fed at milking time, she cannot be milked satisfactorily until given her feed. Take special care to secure all the strippings. The first milk drawn may contain as little as 1 per cent of fat while the strippings contain from 6 to 10 per cent.

Most of the objections to milking made by hired help are due to the conditions under which the work is often done. To have satisfied help, make the milking a part of the day's work and not a chore to be done extra. Then have a clean, well lighted, comfortable barn in which to do the work and some modern or convenient system of handling the manure, preferably by overhead carrier. Under such conditions most of the objections to milking will disappear.

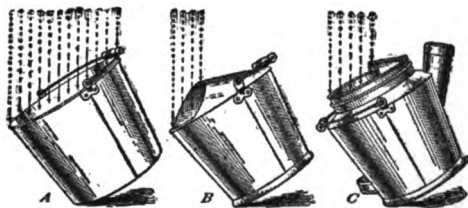


FIG. 515. Three types of milk pail; a common open type; b the Loy pail; c the Gurler type which carries a cloth strainer. The arrows suggest how much dirt is kept out of small topped pails.

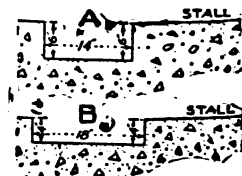


FIG. 514. Sections and dimensions of two popular forms of gutter used in dairy barns. (Wisconsin Bulletin 185).

The small topped pail. Within recent years the use of the small topped pail has become quite general. A look at the dirt caught on the covered part of such a pail during milking will convince any one that the covered pail is a good thing. Careful tests have shown that only one-third as much dirt gets into the milk when the small topped pail is used



FIG. 516. Clean cows are necessary in producing clean milk—and also profitable.

as when the ordinary open topped type is used. Various forms of such a pail may be bought or a tinner can fit a tin hood to an ordinary pail.

The Milking Machine

The milking of cows by means of a machine (which has long been one of the greatest needs of the dairy farmer) is now past the experimental stage although many improvements will undoubtedly be made in the future. Milking machines are giving satisfaction in the hands of many people; and while others have discarded them after more or less use, it

seems safe to say that the machine does not injure the cows in any way and that in fact, the animals prefer it to hand milking.

Since, with a milking machine, one man can milk 25 to 30 cows in an hour, it saves considerable labor, although it requires some extra time for cleaning. When the machine is kept thoroughly clean the milk drawn by it is cleaner and has better keeping qualities than that milked by hand; otherwise (and unfortunately this is too often the case) it may be in much worse condition than when hand drawn. The whole sanitary question hinges upon how the machine is cleaned. In every case the instructions supplied with the machine should be followed carefully. The practice of stripping by hand after removing the machine is also considered neces-

sary for successful results.

At present, owing to its cost and the time needed to clean it, the milking machine cannot be said to be practical for less than about 30 cows. An outfit for 30 to 50 cows will cost from \$350 to \$500. It is questionable whether the machine milked cow gives as much milk during the year because she does not always hold up quite so well near the end of the lactation period. However, the results are probably equal to those obtained by careless milkers or when frequent changes in milkers are made. Any one thinking of installing a machine should visit a farm where one is in use and study the matter carefully for himself.

How often to milk. Milking 3 times daily is practical with very heavy producing cows and is always practised when the object is to get the largest possible record. Few Holstein cows can produce over 60 pounds, and few Jerseys or Guernseys over 40 pounds daily in 2 milkings. When the udder becomes congested to a certain point no further secretion of milk occurs until the congestion is relieved by milking. With cows of ordinary capacity the increased production is not sufficient to pay for the extra labor involved in a third milking.



FIG. 517. A farm-made device to save the trouble of carrying a milk stool.

Keeping Milk Clean

Cleanliness and bitter milk. Bitter milk and cream is a rather common trouble especially in winter. It is usually due to one of two conditions and the first thing is to determine which is the cause in any particular case.

1. If the milk is bitter when first milked the trouble is with the cow or her feed. Occasionally for no known reason cows give bitter milk near the end of their milking period, the bitter condition being usually accompanied by difficult churning of the cream. In some cases, at least, the cause seems to be overfeeding with grain. If the cow is receiving a heavy grain ration, try cutting it down materially and giving her two or three 1½ pound doses of Epsom salts at intervals of 2 or 3 days.

2. If the milk develops the bitter taste

sometime after it is drawn it is due to the growth of a certain kind of bacteria that has entered the milk usually in the barn. To prevent this all utensils, including separator parts, strainers, cans, and pails, must be thoroughly washed and scalded as directed below, and the milking done in the cleanliest manner. If cream desired for buttermaking develops a bitter taste try leaving it in a warm place immediately after it is skimmed or separated so that it will sour quickly. If all other means fail, try heating the milk soon after it is drawn to a temperature of 145

degrees and holding there for about 20 minutes. (If no thermometer is at hand heat until a scum forms on the surface). Then cool it for about 20 minutes.

Does it pay to strain milk? Even the most efficient straining has practically no effect upon milk's keeping qualities or healthfulness, and is valuable mainly as a means of improving its appearance. Experiments have shown that about two-thirds of the dirt that falls into the milk dissolves and can never be removed, only the coarser portions being taken out by straining. Milk passed through more than a dozen clean cloth strainers in succession has shown no improvement whatever in keeping qualities. For general use, therefore, the usual fine mesh wire gauze strainer is best. A cheese cloth over the gauze will remove more of the impurities but a cloth strainer unless washed with great care does more harm than good. Wherever special care is taken a common practice is to use a new piece of cloth for each straining. Otherwise the cloths should be boiled daily and hung in the air where they will dry quickly.

How to Care for Dairy Utensils

The condition of the pails, strainers, and cans has more to do with the keeping quality of milk than anything else *except* the cleanliness of the cow and the temperature at which the milk is kept. It is not enough to merely have them free from visible dirt; a pail may be washed and then wiped out with

a dish cloth that leaves an invisible coating of germs. Always wash all utensils as soon as possible after they have been used; otherwise the milk dries and is hard to remove. The first water should be warm but not too hot or it will cook the milk to the surface of the vessel; a small amount of some good washing powder should be added to cut the grease. A brush of the proper shape that goes into all the corners is much better for cleaning dairy utensils than a cloth that rubs over the cracks leaving them filled with sediment. After using the brush and warm water rinse with a little scalding hot water and leave to dry in the sun without wiping. Well constructed, heavy tin pails and cans are the only kind to be recommended for handling milk and special attention should be given that their joints and seams are smooth. If not in this condition when purchased have a tinner fill them with solder. Badly rusted cans should not be used for storing milk for market or family use as tests have shown that they can not be thoroughly cleaned even with the best of care.

Why and How to Cool Milk

The length of time milk will keep sweet depends upon cleanliness and proper cooling. By keeping it clean we keep out the bacteria which cause it to sour or spoil; by cooling it we prevent those bacteria that *do* get in from growing, yet few realize the tremendous effect of the treatment. By doing so an American farmer sent milk to the World's Fair at Paris, France, that not only arrived in good condition but remained so several days after its arrival. The writer divided a can of milk and cooled one-half to 50 degrees and the other to 75 degrees. The one held at 50 degrees remained sweet 3 days, the other soured in 28 hours.

Milk is usually cooled on the farm but often in a far from effective way. The mere putting of warm milk in an ordinary ice box is not satisfactory; it requires nearly 12 hours for a gallon of warm milk to reach a temperature of 60 degrees in an ordinary refrigerator. An 8 gallon can of milk placed in a tub of well water, as is often done on the farm, is seldom cooled below 70 degrees by the following morning and naturally the milk will not keep long although if to be sold, it is necessary that it keep sweet 12 to 24 hours. A thermometer should be at hand and used often enough to know what is really being accomplished.

When much milk is handled a special cooler in which ice water or plenty of real cold well water is used is best. When no such cooler is at hand the can may be set in a tank of cold water with fair success especially if ice is available. When a windmill is used a good arrangement is to have the water pumped through a small milk cool-



FIG. 518. Popular type of farm milk cooler in use. This and all other cooling machines must be used in a dairy building or room set apart from the barn itself,

ing tank into the supply tank. When milk is cooled in the can it should be stirred several times after the cans are placed in the water.

Skimming, Separating, and Caring for Cream

The shallow pan method is the oldest and least effective of the two gravity systems now in use and only its simplicity and low cost are responsible for its wide use to-day when the cream separators on farms are numbered by the hundreds of thousands. In this method the milk is poured into shallow pans or crocks soon after milking, before the cream has had time to rise (the milk should not be more than 4 inches deep). The pans are placed in a cool place—a basement or sometimes in a special dairy house or cave—for 24 to 36 hours when the cream is removed with a concave tin skimmer. Cream secured in this way varies widely in richness depending upon how long the milk has set and how much skimmilk is taken with it; ordinarily, it tests from 20 to 25 per cent of fat but may go as high as 40 per cent. Do not attempt to get it too thick for to do so it is necessary to leave some of the thinner parts of the cream layer. The skimmilk from this system is usually sour, often curdled and in most cases so old that its feeding value for some purposes is greatly injured. It is possible to use it for feeding calves 2 months old or over, even though sour, if care is taken to accustom them to it, and to have it sour each time, but even then the results cannot be expected to equal those from feeding sweet skimmilk from a separator. For pigs and chickens sour milk does as well as sweet and is preferred by many.

The most serious objection to the shallow pan method cream is the resulting loss of butterfat. Even with the greatest care the skimmilk will often contain as much as three-quarters of a pound of fat in each 100 pounds. This means that if the original milk tests 4 per cent butterfat, nearly one-fifth of this is lost in the skimmilk; or, in other words, the cream from 1 cow in 5 is so lost. Of course, the fat left in the skimmilk has value as feed but a pound of cornmeal will practically take its place and is much cheaper. Shallow pan cream does not generally make as good butter as cream secured by the deep setting system or from the separator, because of the time required in raising it and the exposure of such a large surface to the air.

The deep setting method. The most effective means of getting cream by gravity is the deep setting system, but it is practical only where ice or large quantities of *very* cold water are available. The milk is placed in cans, about 8 inches in diameter and 20 inches deep, and these are set in a tank of water of which the temperature should not go above 50 degrees, and which should stand nearly as high in the tank as the cream does in the cans. Skimming is usually done after 12 hours but may be delayed until 24. A conical dipper on a long handle is used or the skimmilk is drawn off through a faucet in the bottom of the can. The cream secured by this method always tests low, usually 18 to 20 per cent butterfat, but it is still sweet when skimmed and in excellent condition for making butter generally equal in quality to that from separator cream. The skimmilk is also sweet and in excellent condition for family use or for feeding calves, pigs, or chickens. The loss of butterfat in the skimmilk



FIG. 519. Two methods of skimming cream. Left, shallow pan system; right, deep setting system



FIG. 520. The separator is now the established method for skimming, especially on a large scale.

is small compared with that in the shallow pan system; under good conditions the skimmilk will not test over three-tenths of 1 per cent, which means there will be about 5 ounces of butterfat in each 100 pounds of skimmilk.

The cream separator. Although a comparatively new invention (farm sizes first appeared about 1890) the cream separator is such a vast improvement over all gravity systems that it has come into very general use, being employed in some cases where only one or two cows are milked. Foremost among its many advantages is the fact that it gets practically *all* the cream out of the milk; the skimmilk from a separator usually contains less than one-tenth of 1 per cent of fat. Four cows and a separator are therefore equal for butter-making purposes to 5 cows of the same quality and the shallow pan system. The next advantage is that the skimmilk is available for feeding purposes while still sweet and warm. Calves can be raised on it as well as if nursed by the cow.

The saving of work for the farm women is very important when much milk is produced. In a gravity system they have numerous pans or cans to wash and the milk to skim and handle. When a separator is used the men often operate and wash it, feed the skimmilk at once, and bring to the house for the care of the women only the small pail of cream. While washing the separator parts is no small task it is less than cleaning a collection of pans or pails.

Cream from a separator is in the best possible condition for use by the family or for buttermaking. Many farmers who sell neither cream nor butter consider that the saving of labor and the improvement of the cream and butter secured for table use, amply justify the purchase and regular use of the machine.

How to use a separator. When buying a separator always get one plenty large. A machine with a capacity of 700 pounds per hour for example, runs but slightly harder and costs but little more than one with a capacity of 450 pounds, and when used twice daily it makes a big difference whether the time required for separation is 10 minutes or 20. With 10 good cows in milk a person might expect, at the flush of the season, to have to separate at least 150 pounds of milk at each milking. With a 450 pound machine this would require at least 20 minutes; with a 700 pound machine it would take only 13 minutes.

The practice sometimes followed of washing the separator but once a day should not be permitted under any circumstances. The only way to get good cream for either home use or sale is to clean the separator thoroughly each time it is used, following the directions given for cleaning utensils. All who have used

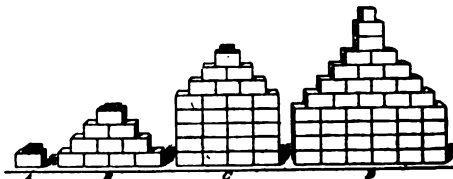


FIG. 521. Amount of butter lost in one year in separating the milk of one cow by different methods; a hand separator (1.2 lbs.); b deep setting system (10.1 lbs.); c shallow pan system (26.2 lbs.); d water dilution system (40.5 lbs.). (Indiana Bulletin 116).



FIG. 522. Loss of butter in one year from milk of one cow separated at different temperatures; a at 90 degrees (1.3 lbs.); b at 75 degrees (3 lbs.); c at 60 degrees (7.1 lbs.); (Indiana Bulletin 116).

separators know that the coarser impurities from the milk are left in the bowl in the form of a nasty slime. If this is allowed to remain it is largely decomposed when the machine is next used, the second lot of milk thus becoming contaminated with bacteria and decayed matter that not only makes the cream of

poor quality for buttermaking but also may even make the skimmilk a dangerous food for persons or young calves.

The separator should be conveniently placed where flies can be kept out in summer and where it will not be too cold in winter. Some prefer it in the dwelling house, provided room is available, but the best arrangement, especially where much milk is handled, is to have a special milk house handy to the barn where the milk is separated and the cans and pails are kept. This should have a concrete floor with a drain to facilitate cleaning and, if the amount of milk handled justifies the expense, a small boiler to supply hot water for cleaning and steam for sterilizing. If this is done a suitable vat for washing is also needed, and, ordinarily, a tank in which to cool the milk or cream.

How to care for cream. Caring for cream on the farm involves exactly the same principles as discussed under cooling milk (p. 452). This means, first, cows kept free from visible dirt on the bodies, a clean milker, dressed in a reasonably clean suit, utensils properly cleaned and sterilized, and a regular thorough cleansing of the separator; and second, the cooling of the cream *quickly*. The most practical way on most farms is with cold water or ice if available. The chief

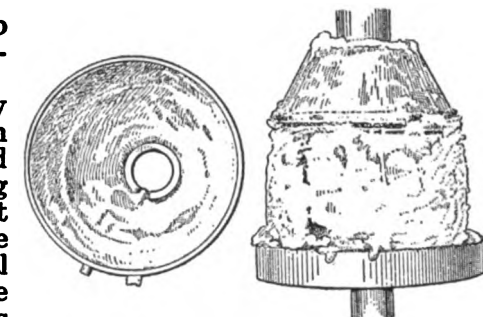


FIG. 523. Separator bowl showing the collection of slime left even when the machine was flushed with water after being used. Here is one reason why dairy utensils should be thoroughly washed.

difficulty with well water is that it is not generally cold enough. Don't make the mistake of using too little water; 2 or 3 barrels full in a tank will remain cool for some time, while the amount held by a tub or half barrel is rarely able to cool the cream sufficiently and hold it at a low temperature.

Cream should be examined occasionally with a thermometer to find out if it is really as cold as it should be. Cooling



FIG. 524. Butter lost in one year in separating the milk from one cow at different speeds: a full speed (1.75 lbs.); b crank speed reduced ten revolutions (7.28 lbs.); c crank speed reduced twenty revolutions (12.74 lbs.); (Indiana Bulletin 116).

is not effective unless it brings the cream to 60 degrees within an hour after milking. If to be held for 24 hours and sold or used sweet, the cream should be brought to 55 degrees at the highest; if it is to be used for buttermaking, 60 degrees will generally give good results.

Using Skimmilk on the Farm

As human food. There is a tendency to greatly underestimate the value of skimmilk as a food for both humans and growing animals; the old idea that the cream is the only part of the milk having much value dies slowly. Whole milk is not only the only perfect single food but it is one of the most economical on the market; a quart is said to be about equal in food value to any of the following: 2 pounds of codfish or chicken; 4 pounds of beets; one-third of a pound of wheat flour; three-quarters of a pound of lean beef; 8 eggs; 2 pounds of potatoes; 7 pounds of lettuce. Skimmilk has less food value than

whole milk but, according to the United States Department of Agriculture, 2½ quarts of skim-

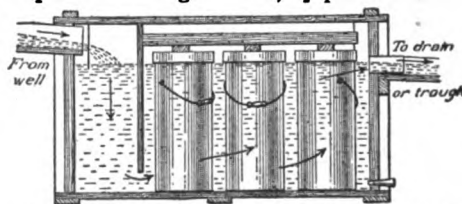


FIG. 525. Section of home-made milk tank for cream; the overflow can be used to supply the stock watering trough to lessen waste.

milk is equal in food value to a pound of round steak; a skim milk oyster stew has more food value in the skim milk than in the oysters; it has been found that a lunch costing 15 cents containing 9 food materials, had less food value than one of bread and skim milk, costing 4 cents. Skim milk is especially rich in the muscle forming substance known as *protein* which is most likely to be lacking in ordinary foods.



**\$31.25 PROFIT
ONE YEAR**



**\$ 31 PROFIT ON
THESE 40 COWS
ONE WHOLE YEAR**

YOU CAN'T AFFORD TO GUESS

FIG. 526. One good cow is worth 40 poor ones and costs little if any more to feed than any one of them. Weighing and testing milk regularly shows what your cows are worth. (Courtesy International Harvester Co.)

For Feeding Stock. If well bred heifer calves are on hand probably the best use to which the skim milk can be put is to raise them. As a rule where the special dairy breeds are kept it will not pay as well to use the skim milk for raising surplus males as steers as to feed it to growing pigs or laying hens. Henry and Morrison in "Feeds and Feeding" state that a combination of skim milk and grains such as corn, barley, wheat,

kafir, etc., stands unexcelled for the economical growing and fattening of swine. The growth made when skim milk or buttermilk supplements corn usually exceeds that produced by any other combination. At the Missouri Experiment Station Waters secured the following results with growing pigs:

	AVERAGE DAILY GAIN IN POUNDS	POUNDS OF GRAIN FOR 1 POUND OF GAIN
Corn and blue grass	.71	5.2
Corn and green clover	.87	4.29
Corn and green alfalfa	.95	3.97
Cornmeal and rape	.78	4.82
Corn and skim milk	1.81	2.44

According to Henry and Morrison the value of skim milk per 100 pounds for pig feeding when fed at the rate of 3 pounds to 1 of grain is: 24 cents when corn is worth 45 cents a bushel, 28 cents when corn is 50, 31 cents when corn is 56, and 46 cents when corn is 80 cents. Hoard says to find the value of 100 pounds skim milk fed alone: "Multiply the market price of live hogs in cents per pound by 5; if fed with corn or barley, multiply by 6."

As part of the ration for laying hens skim milk is unexcelled. Kempster of the Missouri Experiment Station obtained an average of 131 eggs per hen per year from a group fed sour skim milk, while similar groups receiving only grain averaged but 65 eggs in the same time; the cost of a dozen eggs in the first case was 10 cents, in the second, 22 cents; the profit per hen for the year where skim milk was fed was \$1.13, while those kept on grain alone showed a loss of 4 cents each!

Shall We Sell Milk or Cream?

Many dairy farmers are so situated that they have little choice as to what they will sell. The chief determining factor is ordinarily *distance from markets*. Milk is the most bulky and most perishable of the dairy products and for this reason is best produced nearest to the place where it is consumed. Farms favorably located for selling milk cannot as a rule afford to sell butter or cream for buttermaking. Milk sold at retail brings the largest income but the expenses of delivering are much more than are generally realized, amounting with the modern bottling system, to about 4 cents per quart. Milk sold at wholesale brings less income but the net profit may be as much as or more than that from retailing. Thus the only advantage in favor of selling milk is the larger income it brings. There are some strong disadvantages; one is the difficulty with which heifer calves are raised to maintain the herd when no skim milk is available. Deliveries must

also be more frequent and more cans and better cooling facilities are required.

The farmer located outside the limits of the economical milk shipping zone either sells butter or depends upon the creamery or cheese factory for his market. Milk sold in the form of cream for buttermaking, or as butter, brings the least return, but there is seldom any difficulty in finding a market for these products in any quantity and at any time. Again, the expenses of cooling and delivering are small as compared with those involved when milk is sold, and sufficient skim milk is thus provided to raise calves for maintaining the herd and to serve as an exceedingly important addition to the ration for the pigs and chickens.

Farmers are often offered opportunities to dispose of their dairy products in one of several ways and are puzzled to know which gives the best return. For example, is it best to sell milk at 20 cents a gallon or cream

testing 30 per cent fat at \$1.00 per gallon? Or, which brings the most, cream sold to a creamery at 35 cents per pound of butterfat, or cream testing 20 per cent of fat sold to a hotel at 75 cents per gallon?

In order to answer these questions and others like them it is necessary to know the weights of milk and cream of different qualities, as given in the accompanying table. In the first problem it is also necessary to know the richness or "test" of the milk, that is the number of pounds of butterfat it contains per 100 pounds. Suppose we use the Babcock test (p. 443) and find this to be 3.8. It will simplify matters to put both milk and cream on a 100 pound basis. Then, since a gallon of milk weighs 8.6 pounds, there will be in 100 pounds, 100 divided by 8.6 or 11.6 gallons, which at 20 cents will bring \$2.32. A gallon of 30 per cent cream, according to the table, weighs 8.32 pounds of which 30 per cent is butterfat or $8.32 \times .30 = 2.49$ pounds. Thus in 30 per cent cream at \$1.00 a gallon butterfat is worth \$1 divided by 2.49 or 40.1 cents a pound. At this rate 100 pounds of 3.8 per cent milk would be worth 40.1×3.8 or \$1.52, whereas if sold as milk at 20 cents a gallon it was worth \$2.32. But when the cream is sold there remains 87 pounds of skimmilk for each 100 pounds of whole milk handled; in other words by selling milk at 20 cents a gallon 80 cents is received for every 87 pounds of skimmilk included.

The second problem is simpler. The table of weights shows that 20 per cent cream weighs 8.4 pounds per gallon. Each gallon of this cream, therefore, contains 8.4×20 , or 1.68 pounds of butterfat. Since one gallon of this cream brings 75 cents, the rate per pound of butterfat is 75 divided by 1.68 or 44.6 cents per pound of butterfat in the 20 per cent cream at 75 cents per gallon. The price of 75 cents per gallon for 20 per cent cream,



FIG. 527. The wrong way to market milk or cream. Always protect cans, bottles, etc., from extremes of heat or cold; and aim to carry enough at each load to justify the trip.

therefore, means 9.6 cents more for each pound of butterfat sold, than if the cream were sold for 35 cents per pound of butterfat.

WEIGHTS OF CREAM AND MILK

PRODUCT	PER CENT FAT	WEIGHT (LBS PER GALLON)
Water		8.34
Skimmilk		8.64
Average milk,	4	8.60
Cream	15	8.44
Cream	20	8.40
Cream	25	8.36
Cream	30	8.32
Cream	35	8.16
Cream	40	8.04
Cream	45	7.96
Cream	50	7.88



Fig. 528. Types of milk bottle caps. The two at the left are of paper and, though commonly used, are not sanitary. The metal covers at the right protect the milk and are required for all certified products.

CHAPTER 42

Commercial Dairying

By ERNEST KELLY, in charge of market milk investigations, of the Dairy Division of the U. S. Bureau of Animal Industry. Farm reared, a graduate of the dairying course at Cornell University and constantly and thoroughly in touch with conditions all over the country, Mr. Kelly is especially equipped to discuss this subject fully and clearly.—EDITOR.

MILK production on a large scale is attended with many problems making it quite different from milk production on smaller and more general farms. The latter usually sell milk as a side issue, the main purpose in keeping a few cows being to provide enough for home use, whole and as cream and butter, to use up certain unsalable crop products, to supply valuable fertilizer and to provide work during the winter months for the farmer and his family.

Large commercial dairies on the other hand depend upon milk sales for their principal income. They may be divided into three general groups (though some plants combine features of two or more): (1) certified milk dairies; (2) dairies where registered cattle are bred; and (3) commercial market milk dairies. The first two are perhaps more highly specialized than is the third. Certified dairies produce a very high grade of milk under the supervision of a medical milk commission which frequently tests its bacteria content and composition and inspects

such matters as the health of attendants and cattle, sanitary conditions on the farm, construction and arrangement of buildings, etc. This milk usually sells at from 12 to 20 cents a quart and is generally used raw for the feeding of infants and invalids; but all the certified milk produced in the United States amounts to only about one-half of one per cent of the total milk consumed in the fluid state. Much of the certified milk, though not all, comes from dairies which maintain large registered herds from which the sale of milk represents the principal source of income. In some dairies, however, where valuable registered animals are kept, the returns from the sale of milk are made secondary to the income derived from the sale of surplus breeding stock. Many establishments of this kind are found near large cities, notably in the East, whereon large sums of money have been invested in equipment and in the purchase of foundation stock. These places should, in many instances at least, be regarded as model breeding establishments rather than as commercial dairies. Other commercial dairies represent a rather evenly balanced combination of dairy and breeding activities.

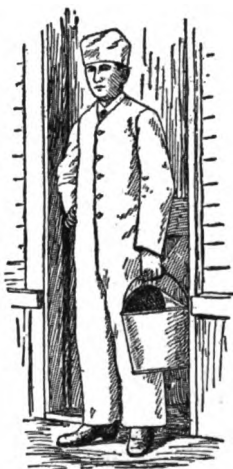


FIG. 529. A feature of the clean sanitary dairy is its cleanly dressed dairymen and milkers.

Advantages and Disadvantages

Advantages. On the commercial market milk farm whole milk is the revenue producer, all farm practices revolving about the dairy. Generally speaking, the dairy is like the factory—the larger it is the lower is the cost of production per unit—for these reasons: (1) The “overhead costs,” especially interest on the investment, are lower per unit on the large farm. One dairy house may handle 1,000 gallons of milk a day, while another one costing only a little less may handle only 500; in the first case, the cost per gallon chargeable to the milk house is lower than in the second. (2) The large dairy can buy feed, dairy supplies, etc., at wholesale prices and thus effect considerable saving. (3) Labor can be used to better advantage in the big dairy; the work to be done is more uniform,

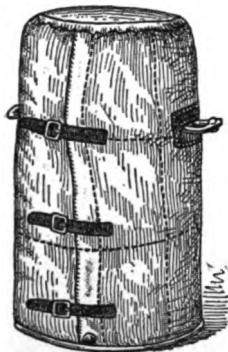


FIG. 530. A milk can in its winter quilted jacket which is also useful in the hottest weather.

and it is possible for one man to work at one job practically all the time, saving the time and energy lost in changing from one kind of work to another. (4) The larger income of the big farm permits the employment of an expert to supervise the general farm system. On many commercial dairies other experts are employed to look after the various subordinate branches of the business. Thus we sometimes find one man in charge of crop production, another of the herd and milk production and still another of the business or marketing end. (5) The production of high-grade milk in large quantities gives the commercial dairy a decided advantage in selling its product, whether retail or wholesale to a city dealer. Dealers like to buy from big dairies because the supply is usually more uniform both in quantity and quality. Of course, in dairying as in any other business, there is a point beyond which it is unwise to increase the investment in one plant.

Disadvantages. Practically the only disadvantage is that the investment and consequent risks are greater. Cattle losses through epidemics, or business losses due to poor management are very apt to destroy the commercial dairy, while the small farmer with only a few cows, could, in spite of a similar disaster, be carried along by his other sources of income. The small dairy does not require the employment of a large amount of high priced labor, but frequently makes it possible for the young people of the farm family to be profitably employed at home.

Conditions Necessary for Success

Careful study of the situation. To be successful in commercial dairying, one must first study the market requirements so that he will be in a position to supply just the class of milk that the consumer demands. This is especially important in the large dairy as the producer is usually in much closer contact with the consumer than is the owner of the general farm who sends a few cans of milk to the creamery or skimming station. The big dairy is in the limelight and must stand or fall with the reputation of its product. The city milk market requires that milk be fresh, normal in appearance, free from objectionable flavor, odor, and visible impurities, unadulterated, of good food value, free from any disease-producing bacteria and from too many bacteria of any sort.

Good management and labor supply. No commercial dairy can succeed without the best sort of management; the margin of profit is usually so narrow that only a man skilled in both dairy farming and business methods can succeed. It must be located so that a plentiful supply of labor can be obtained. If the owner of a few cows wakes up and finds that he has no hired man, he can easily milk his cows and get the milk to the station; but if the manager of the commercial dairy finds himself short of help, it may be physically impossible for his remaining men to get the milking done by shipping time.

Good location. As large amounts of milk and sometimes of feed have to be hauled, it is essential that the dairy be located on or near good roads. The railroad must be near at hand providing sidetrack facilities for loading milk or unloading feed, and con-



FIG. 531. The popular New York type of milk can.



FIG. 532. The Elgin type is equally popular in certain sections.

venient and reliable service so that there may be no delays in marketing the milk.

Moderate land values. The question of land values and fertility is one of the utmost importance. Sometimes on account of the advantage of being near his market, the commercial dairyman can afford to locate on high-priced land near some large city; usually the best plan is to go farther away, on some good transportation line, where land of equal productiveness can be bought for less money. If the owner can afford to wait a few years for his profits and meanwhile buy a large part of his feed, it sometimes is possible to buy cheap, rather poor land which can be

built up with generous applications of manure.

A good market. Last but not least is the market. No matter how skilfully or cheaply milk may be produced, if there is not a ready market for it at fairly profitable prices, the dairy can not be a commercial success. A dairyman before locating in any section would do well to study local market prices of milk, cream, and butter extending over a number of years. Sometimes, because of unusual temporary conditions, a market may appear very attractive, whereas if the prices for several years back are studied, the outlook may not be so rosy.

Types or Commercial Dairying

Commercial dairies in general may be divided into two groups, based on the type of farming followed. The first group consists of farms on which all or nearly all of the feed for the cows is grown, and calves are raised to replenish the herd. Dairies in the other group buy most of the feed used and purchase fresh cows to take the place of those no longer useful, raising few or no calves. Generally the first type, requiring more acreage per cow, is carried on where land is cheaper; the other type flourishes nearer cities. On farms where milk brings a high price it is often customary to raise no calves because of the high value of the milk needed to feed them.

It is clear that the first type is the more constructive, that is, aims at real, continuous improvement of the herd. Cows may be tested for production, a registered bull kept, and by the selection of heifer calves from high-producing dams, the average production of the herd can be increased. Again, a farm where most of the feed is raised is reasonably independent of the feed market and its price fluctuations. This system also has marked advantages in keeping up the health of the herd which may be closely watched and, if no animals are brought in from outside sources, more easily cleaned up, and kept free from disease.

The second type, needing less acreage, can be carried on where land is more expensive, and therefore much nearer the market. Not so much labor is needed, so this system is adapted also to localities where it is difficult to secure help at reasonable wages.

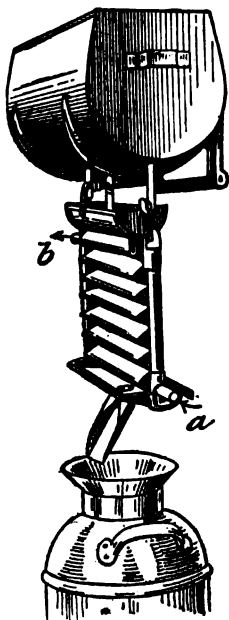


FIG. 533. A popular type of milk cooler for commercial dairies. Ice water or brine enters at *a*, passes through the metal ridges and out at *b*, cooling the milk more rapidly than the type shown in Fig. 525

Investment

The total investment in commercial dairy farms is often very large, depending to a great extent upon the value of the land, the system of farming followed, and the processes through which the milk is put. The amount of land required varies considerably according to its fertility and whether or not feed and

young stock are raised; only an estimate can be made for this item. The cost of building materials and construction also varies in different localities. However, the following figures will give some idea of the investment required in starting a dairy farm to carry 50 cows, with a daily output of 500 quarts of milk. On this farm, it is intended to raise all the roughage and most of the grain feeds.

280 acres of land at \$125.00 per acre	\$35,000.00
50 cows at \$100	5,000.00
2 purebred bulls	500.00
Barn for cattle and feed	5,000.00
2 silos (concrete), capacity 125 tons each	550.00
Dairy house	500.00
Ice house, capacity 150 tons	500.00
Barn equipment	450.00
Milk house equipment, cooler, cans, pails, etc.	300.00
	<hr/>
	\$47,800.00

In addition there would be needed a considerable sum for dwelling houses, horse barns, horses, harness, feed grinder, engine, farming implements, well-boring, etc., and

other items of which the cost cannot be estimated.

If bottled milk is to be retailed there will be other equipment needed as follows (and the dairy house will probably be more expensive to make room for the extra operations):

Bottling and capping apparatus . . .	\$ 150.00
Bottle washing equipment	55.00
Bottle cases and six months' supply of bottles	600.00

For delivering:

Three horses, two wagons and harness	1,080.00
Licenses, bottle carriers, blankets, lanterns, etc.	30.00
	<hr/>
	\$1,915.00

Handling Milk on the Dairy Farm

It has already been said that large dairies are able to use labor to better advantage than small ones; there may even be separate gangs for each operation. The following schedule is followed on some of the larger dairies where several hundred cows are cared for: (1) The stables are thoroughly cleaned, the cattle groomed and the manure removed an hour or so before milking so that the dust will have a chance to settle. (2) At milking time, 3 or 4 men go ahead of the milkers with pails of water and cloths, to make sure that the cows are perfectly clean, especially around the udders and flanks. (3) The milkers follow closely carrying the milk of each cow to the weigh room to be weighed and sampled. On most farms the milkers do other work part of the time, but at one large farm, they do absolutely nothing else; yet what they accomplish is almost unbelievable. They work for two 5-hour periods, morning and evening, during each of which each man milks 35 cows; or a total for the day of 70 cows in 10 hours! (4) After the milk is weighed it is taken to the milk house and immediately run over large coolers, containing ice water or brine. After being cooled, sometimes to as low as 35 degrees F., it is either put in cans or bottled for shipment or retail delivery.

After each milking is handled all utensils, including pails, cans, strainers, bottles, etc., are very carefully steam sterilized for 20 or 30 minutes in large ovens of concrete, brick, galvanized iron or iron built into the milk house. Sometimes the milk is pasteurized on the farm as described farther on under City Milk Plants. After being cooled the milk, raw or pasteurized, is placed in a refrigerator and held at a temperature just above freezing until time for shipment.

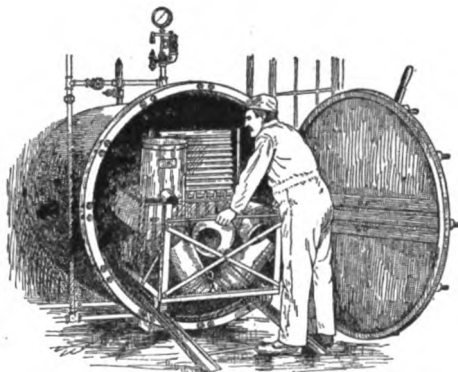


FIG. 534. Metal sterilizing oven such as is used in large, commercial dairies

Transportation

Milk is often sent twice daily from the farm to the city by horse-drawn vehicles or motor trucks; or it may be shipped daily by steam or electric railway.

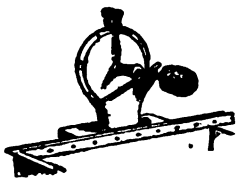


FIG. 535. One type of milk bottle washer run by water power and adapted to both large and small plants.

Great care is exercised to protect it from dust and heat or freezing during the journey. If milk is shipped in cans, these are often enveloped in specially constructed jackets made of felt or other insulating material; if bottled, the bottles are placed in steel or wood cases and surrounded with crushed ice. Some railroads and a few large dairy farms, maintain a special refrigerator service for transporting milk from the country to the city, cars being constructed to preserve low temperatures. The walls and doors are well insulated and the air in the cars is usually chilled by means of ice bunkers placed either in the ceiling or in the ends of the car. Upon its arrival in the city the milk is hauled on large trucks to the distributing plant.

Handling Milk in the City

Sometimes bottling plants are located in the country, the farmers hauling the milk to the plant where it is pasteurized, cooled, bottled, and shipped. However, this practice, having some commercial disadvantages, is not very general. For instance, transportation rates on bottled milk are usually twice as high as on milk in cans, because the bottles and cases add weight and bulk and the carload does not include so much milk. Then, too, the chance of breakage and resulting damages is greater.

The city milk plant must be located where it can obtain a plentiful, fairly uniform supply of good milk which will comply with the demands of the market, and where the market is capable of absorbing the output at prices which will yield a fair profit. Because land is more expensive and building regulations are more strict, the investment in a city plant is higher than in one located in the country. Some plants are of frame construction, but more are of concrete and steel, brick, or hollow tile. An attractive appearance inside and out is considered necessary from an advertising standpoint. A cheap-appearing or ill-kept plant will not attract customers. Concrete floors are considered essential and the inside walls are finished with a smooth cement plaster, enameled brick, or a coating of durable enamel paint. Plenty of windows, screened to exclude flies, must be provided. In addition, many of the larger plants have artificial ventilation systems by which an abundant supply of washed or filtered air is provided.

The expense of building such plants and equipping them with modern apparatus is very great. Stables also must be constructed for the delivery wagons and horses. Some of the larger milk plants resemble small villages, containing blacksmith, carpenter, paint and harness shops where the delivery equipment may be made or repaired. Typical investments, including horses, wagons, and delivery equipment, as well as real estate, buildings, and machinery within the plants, are:

For a plant handling 4,500 gallons of milk daily	\$ 90,000.00
For a plant handling 15,000 gallons of milk daily	375,000.00

or approximately \$18 to \$25 for every gallon of milk handled per day.

What Goes On In the City Milk Plant

In most modern plants the milk upon arrival is at once lifted by means of pumps or elevators to the top story of the building whence it flows by gravity through the various machines located at lower levels. First, however, it is weighed and samples are taken for the Babcock test to determine

the per cent of fat. Next it is usually strained and clarified in a large, rapidly revolving machine where centrifugal force (like that in the separator) removes the sediment. Then it is usually pasteurized, that is, heated, held hot for a stated period of time, then rapidly cooled. The usual pasteurizing temperature, 145 degrees F. maintained for 30 minutes, constitutes the "holding" process. The

"flash" process in which the milk is heated for only a moment but to a higher temperature, is not to be recommended. Milk properly pasteurized, has apparently just as much food value as raw milk, and in addition the disease-producing bacteria are killed along with a large proportion of other bacteria of all kinds.

Pasteurizing. Various machines are on the market for pasteurization, the milk usually being heated by contact with coils or other appliances filled with hot water or steam. Sometimes large vats like cream-ripening vats are used, in which the milk is heated, held and cooled; other machines heat the milk quickly by passing it in a thin stream through a heater whence it runs into holding tanks or coils for the required time. For efficient results the pasteurizing temperature must be very accurately maintained, and to this end many milk plants use automatic temperature controls and recorders which regulate the temperature of the heating medium and record on paper the heat of the milk throughout the run. There are also machines which pasteurize the milk after it is bottled by submerging the bottles in, or spraying them with hot water. Cooling is accomplished in the same manner, cold water being substituted for hot. This lessens the danger of contamination due to unclean apparatus.

When pasteurized in bulk the milk is cooled in much the same manner that it was heated; or else it is run over a large cooler, resembling that used on the dairy farm, and containing ice water, brine, or compressed ammonia which in expanding produces a very low temperature. No milk plant of any size can operate without quite an extensive system of artificial refrigeration, since milk must be cooled, and stored at low temperatures and ice supplied for the delivery wagons.

Bottling. From the cooler the milk passes to the receiving tank of the bottling and capping machine, never coming in contact with the human hand. The tank is emptied by means of valves which fit into the mouths of the bottles, allowing the milk to pass into the bottles and permitting the foam to return to the tank so that each bottle is filled to the proper height with milk free from foam. The bottles then pass under the automatic capper which feeds and presses the caps into place. Some of

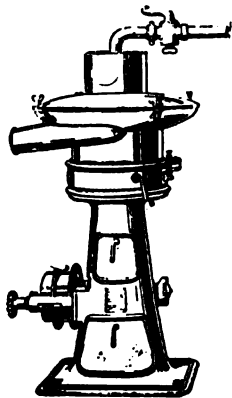


FIG. 536. A milk clarifier, one of the more modern dairy appliances.

these machines fill 24 quart, or 40 pint bottles at one time, filling and capping as many as 8,600 bottles per hour.

Delivering. The filled bottles are then passed rapidly by means of roller conveyors to the refrigerator or cold room and stacked up in cases ready for delivery. This room is kept at a temperature just above freezing, the walls and ceiling being insulated with cork or other material and the room being cooled by ice, brine or ammonia pipes, or with dry, cold air from a special machine. From this room the milk is loaded on to the delivery wagons usually about 1 or 2 o'clock in the morning and left at the consumer's door step before breakfast time. A retail wagon will deliver from 260 to 340 quarts of bottled milk a day in an average journey of about 20 miles.

Bottle and can washing. When the empty bottles and cans picked up by the wagons are returned they are washed in special machines. One of the most important features in milk plant operation is the washing and sterilizing of all utensils, an abundance of steam being needed. All machines and pipes that have been in contact with milk are taken apart and scrubbed with warm water and a washing powder, then rinsed and either placed in a steam oven or put together and drenched with live steam from jets or a hose.

In the smaller plants bottles are washed in a sink on a revolving brush and cans are scrubbed with brushes. In larger plants machines capable of washing 8,000 bottles an hour are employed. The bottles enter these machines on carriers, a dozen in a case, mouths down. Strong pumps force warm water and washing powder into them with sufficient cleansing force, then they are automatically moved along to the next compartment and rinsed with clean, hot water. In a third compartment the bottles are sterilized by means of steam jets or sprays of boiling water. Cans are washed in a similar manner in a special machine.

Cream Standardizing

In most plants there is at certain seasons a considerable surplus of milk for which, whole, there is no sale. This is usually separated in large steam or electrically driven separators similar to but larger than those found on dairy farms. The skim milk may be made

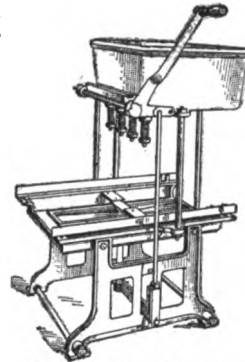


FIG. 537. An efficient bottle filler for the medium sized farm or average retailer, which fills 4 bottles at a time.

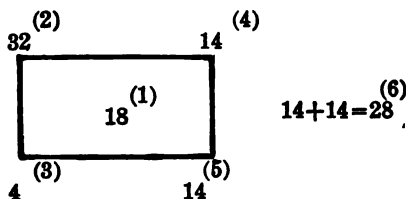


FIG. 538. A typical retail milk wagon

into artificial buttermilk, cottage cheese, casein or other by-products; the cream is sold along the routes or made into butter or ice cream. When cream is sold on the routes it is often necessary to "standardize" it, that is modify it so that it contains a standard per cent of fat. Dealers usually sell two grades of cream—heavy, or whipping cream testing 35 to 40 per cent; and light, or table cream testing about 20 per cent fat. Heavy cream may be standardized to a lighter grade in three ways: First, by the addition of skim-milk; second, by the addition of whole milk; and third, by the addition of a "lighter" or less rich cream.

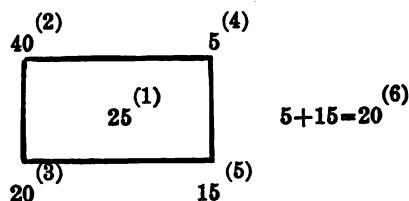
The exact amount of heavy and light cream needed to make a certain amount of a standardized cream may be found very easily in this way: Draw a square and place in the centre the per cent of fat in the cream desired. At the upper left-hand corner place the per cent of fat in the heavy cream, and immediately below, at the lower left-hand corner, place the per cent of fat in the cream or milk to be used in standardizing. Working diagonally across the square, subtract the smaller numbers from the larger and place the differences in the upper and lower right-hand corners. The upper right-hand figure is the number of pounds of the heavy cream, and the lower right-hand figure the number of pounds of the lighter cream or milk, with relation to their total, required to produce the standardized product.

Examples. (A) We want to make 40 pounds of 18 per cent cream from 32 per cent cream and 4 per cent milk. Put down the figures in the order indicated and subtract (1) from (2) and (3) from (1), getting (4) and (5) each half of the total (6):



Then equal amounts (20 pounds each) of the cream and milk will give the desired 40 pounds of 18 per cent cream.

(B) We want to make 35 pounds of 25 per cent cream from 40 per cent and 20 per cent creams. Again put down the known figures, subtract and we get 5 and 15:



Then we know that 5/20 or a quarter of the standardized cream must be 40 per cent cream, or $35/4 = 8.75$ pounds; and 15/20 or three quarters must be 20 per cent cream, or $35 \times \frac{3}{4} = 26.2$ pounds.

In standardizing cream the following points should be carefully observed:

1. Test accurately the milk and cream to be used in standardizing.
2. Exercise great care in figuring the quantities to be used.
3. Sterilize all vats, stirrers, etc., which come into contact with the milk or cream. Standardize in a clean room and guard the product from fly and dust contamination.
4. See that the materials used are thoroughly mixed.
5. Test the finished product to make sure that no mistake has been made.

Some milk plants use a machine called a *homogenizer* to give cream a uniform consistency or to work up butter and skimmilk for ice cream making. In it the cream, etc., is forced through small openings under a pressure of 2,000 pounds or more per square inch, its fat globules being thus broken up.

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF ANIMAL INDUSTRY
DAIRY DIVISION
SANITARY INSPECTION OF CITY MILK PLANTS
SCORE CARD

Owner or manager _____

Street and No. _____

City _____ State _____

Trade name _____

Number of wagons _____ Gallons sold daily } Milk _____
Cream _____

Permit or License No. _____

Date of inspection _____ 191__

Remarks: _____

FIG. 539. One side of the official score card for city milk plants of which the reverse is shown on opposite page. (Bureau of Animal Industry).

Health Regulations

A number of cities require that all cows from which milk is sent into the city shall be submitted annually to the tuberculin test. Other cities stipulate that if the cows are not tuberculin tested their milk shall be properly pasteurized. Many cities have adopted systems of grading milk, under which it is classified according to its cleanliness and safety and sometimes with reference to its food value. Space will not permit of a description of these grading requirements. In the main they are beneficial to both producer and consumer as they allow milk to be sold on its merit, a good milk being recognized as warranting a higher price.

Most cities having milk laws set a maximum standard limit for the number of bacteria the milk may contain. These standards vary considerably: two cities for instance require that the milk contain less than 5,000 bacteria per cubic centimeter (about 18 drops) while 3 cities allow the milk to contain as many as 1,000,000 bacteria per cubic centimeter. The

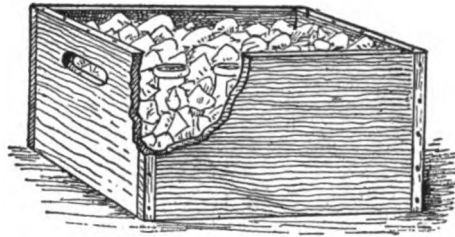


FIG. 540. The highest grades of bottled milk are packed and shipped in ice-filled boxes

most common limit (set by 77 cities out of 167 in 1914) is 500,000 bacteria per cubic centimeter. Another requirement commonly in

force is that the milk shall be cooled and kept cold, usually below 50 degrees F. Some cities require that dairy farms be kept in such sanitary condition that they will receive at least a certain "score" (usually about 60) on a standard score card (p. 449). On this page is shown the score card in use for city milk plants.

EQUIPMENT.	SCORE.		METHODS.	SCORE.	
	Full.	Ab. lowed.		Full.	Ab. lowed.
BUILDING			BUILDING	14	
Location: Free from contaminating surroundings.....	2		Cleanliness.....		
Arrangement.....	7		Floors.....	2	
Separate receiving room.....	1		Walls.....	2	
Separate handling room.....	2		Ceilings.....	2	
Separate wash room.....	1		Doors and windows.....	1	
Separate milk room.....	1		Shafting, pulleys, pipes, etc.....	1	
Separate butter room.....	1		Freedom from odors.....	2	
Separate refrigerator room.....	1		Freedom from flies.....	2	
Construction.....	12		APPARATUS	7	
Floors tight, sound, cleanable.....	2		Cleanliness.....		
Walls tight, smooth, cleanable.....	1		Thoroughly washed and rinsed.....	2	
Ceilings smooth, tight, cleanable.....	1		Milk-handling machinery.....	2	
Drainage.....	2		Pipes, cans, etc.....	1	
Floors.....	1		Sterilized with live steam.....	2	
Sewer or septic tank.....	1		Milk-handling machinery.....	2	
Provision for light.....	2		Pipes, cans, etc.....	1	
(10 per cent of floor space.)			Protected from contamination.....	1	
Provision for pure air.....	2		BOTTLES	7	
Exhaust.....	1		Thoroughly washed and rinsed.....	2	
Minimum of shafting, pulleys, hangings, exposed pipes, etc.....	1		Sterilized with steam 15 minutes.....	2	
APPARATUS	15		Inverted in clean place.....	1	
Bodies.....	2		HANDLING MILK	22	
(Water heater, 1.)			Received below 50° F.....	2	
Appliances for cleaning utensils and bottles.....	2		(50° to 55°, 2.)		
Sterilizers for bottles, etc.....	2		(55° to 60°, 1.)		
Bottling machine.....	1		Rapidity of handling.....	2	
Capping machine.....	1		Freedom from undue exposure to air.....	2	
Wash bowl, soap, and towel in handling room.....	1		Cooling.....	2	
Condition.....	6		Preemptive.....	2	
Milk-handling machinery.....	2		Below 45° F.....	2	
Pipes, couplings, and pumps.....	2		(45° to 50°, 1.)		
Cans.....	1		Capping bottles by machine.....	2	
LABORATORY AND EQUIPMENT	2		Bottle top protected by cover.....	1	
WATER SUPPLY	2		Storage; below 45° F.....	2	
Clean and fresh.....	1		(45° to 50°, 2; 50° to 55°, 1.)		
Convenient and abundant.....	1		Protection during delivery.....	2	
			(Load in summer.)		
			Bottle caps sterilized.....	1	
			INSPECTION	6	
			Bacteriological work.....	2	
			Inspection of dairies supplying milk.....	2	
			(2 times a year, 2; once a year, 1.)		
			MISCELLANEOUS	4	
			Cleanliness of attendants.....	2	
			(Personal cleanliness, 1; clean, washable clothing, 1.)		
			Cleanliness of delivery outfit.....	2	
Total	60		Total	60	

Score for equipment..... plus score for methods..... equals TOTAL SCORE.
 Note.—If the conditions in any particular are so exceptionally bad as to be inadequately covered by a score of "0" the inspector can make a deduction from the total score.

FIG. 539a. Score card for city milk plants. (See Fig. 539)

CHAPTER 43

Butter Making on Farms and in Factories

By MARTIN MORTENSEN, *Professor of Dairying and Chief of the Dairy Section of the Iowa State College.* He was raised on a farm in Denmark—one of the leading dairy countries of the world—and, after studying and teaching there, came to America where he worked as creamery buttermaker for 3 years. He then took an agricultural course at, and obtained a degree from, the Iowa State College, after which he became superintendent of the largest centralizing creamery in the country. In 1908 he gave up commercial work to accept his present position in which he has aimed especially to stimulate and maintain a close, sympathetic and beneficial relation between producers and manufacturers of dairy products. The modern teacher of agriculture must take the combined viewpoint of farmer and scientist, practical business man and investigator; Professor Mortensen can do just that, and has done it here.—EDITOR.

UNTIL about 1879, when the centrifugal cream separator was introduced, but few creameries buying hand-skimmed cream were in operation and most of the butter produced was made on farms. Dating from about that time, butter making has gradually become one of the leading agricultural industries; by 1909 the annual production of butter in the United States had increased to more than 1,600,000,000 pounds, worth, to its producers, over \$400,000,000.

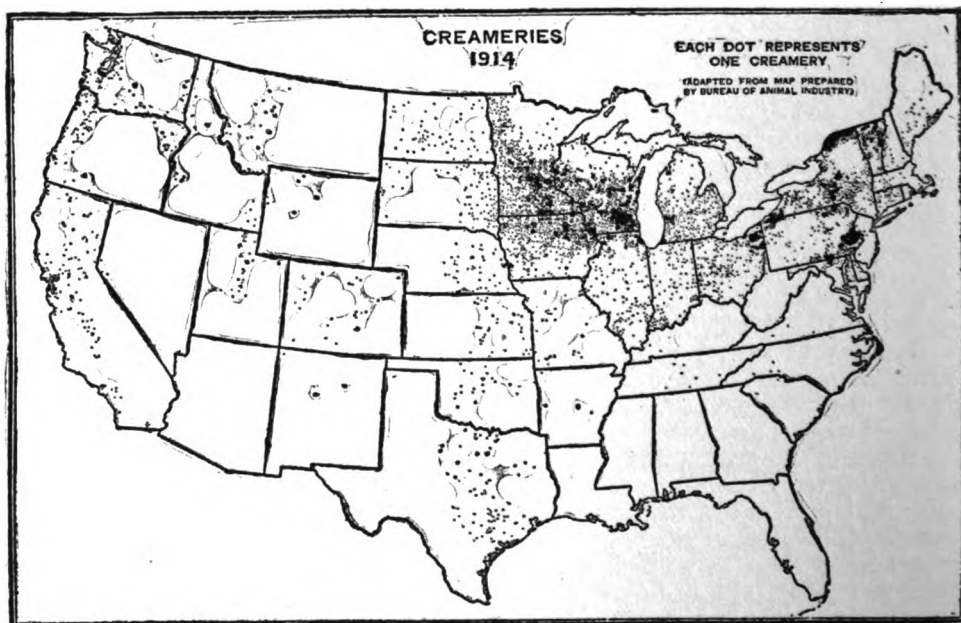


FIG. 541. The distribution of creameries naturally corresponds closely to the distribution of dairy sections (See Fig. 510). Note, however, that creameries are in general located farther out in the country where transportation facilities for making frequent retail deliveries are less developed (1915 Yearbook, U. S. Department of Agriculture).

HOW TO MAKE BUTTER ON THE FARM

Quality of cream. The cream used for buttermaking should be kept sweet and free from taint until it is to be ripened. For best results the milk should be separated immediately or very soon after milking before it has lost its animal heat, the cream being then placed in a pail with straight sides in a tank of cold water and stirred for a few minutes until its temperature falls nearly to that of the water. Warm cream should always be kept in a separate container until properly cooled when it may be mixed with other cream.

Ripening the Cream

Cream should not be allowed to sour naturally as the result is likely to be uncertain and the flavor irregular. Cream is ripened by the action of a germ or a group of bacteria known to produce a certain flavor; if the same organism is always employed we may expect uniform results. It is, therefore, best to use a "starter," which is nothing more than milk soured by a known bacterium which produces the flavor desired.

Making the starter. To prepare a starter: Place from a pint to a quart of good, clean, fresh milk (preferably morning's milk) in a sterilized bottle and keep it at a temperature of from 65 to 75 degrees F. (as near 70 as possible) until the milk has curdled or *coagulated*. If it forms a smooth, solid curd without pin holes and if the odor is clean and pleasant and the flavor nice and creamy, we know that the desirable organisms are present and that the starter—known as the "mother starter"—is satisfactory. To prepare a larger quantity put the required amount of clean fresh milk in a pail, place the pail in boiling water, and heat the milk, stirring constantly, to a temperature of from 180 to 200 degrees F. Hold it here for about 20 minutes, then cool it to 70 degrees, and add the mother starter which has been well broken up by shaking the bottle. After the pailful of milk has coagulated firmly and has acquired a pleasant acid flavor, it may be used as a starter though the curd must first be broken up to a creamy consistency by pouring it from one pail to another. From 1 to 2 per cent of the mother starter is thus added to the milk when preparing a large batch of starter. When once obtained the starter may be renewed from day to day by keeping a small amount from each batch to serve as a mother starter the following day.

Commercial cultures, which may be purchased from various laboratories and firms, are often used in preparing the mother starter. These are added to a pint of good clean milk which has previously been heated to 180 to 200 degrees then cooled to 70 degrees, and well mixed by shaking the bottle. It is well to set a tumbler over the top of the bottle while the milk is souring so as to keep out of it dust and germs from the air. All vessels and utensils after being used in making starter should be well sterilized with steam or soaked in boiling water for not less than 5 minutes.

Ripening the cream. The cream to be ripened for churning should be heated to 70 degrees F. while it is still sweet. The starter is then added in the proportion of from 2 to 5 per cent, and the two mixed well by stirring with a sterilized paddle. The cream may now either be left without stirring or stirred from time to time. Its condition should be carefully observed when it begins to thicken. The flavor, at first rather unpleasant, becomes pleasant and creamy as the ripening progresses, and the acid taste becomes distinct but mild. When the cream reaches this point it should be cooled immediately to churning temperature, for if left any longer at 70 degrees, the acid content becomes too high, undesirable flavors are likely to develop, and the resulting butter will possess poor flavor and poor keeping qualities.

Churning

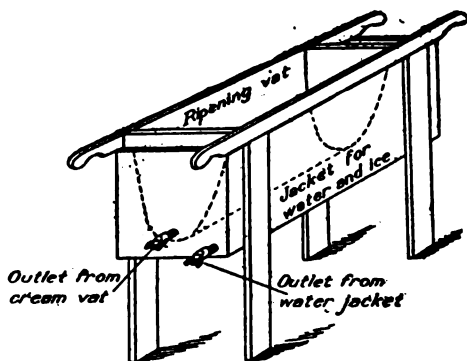


FIG. 542. A simple but effective type of cream ripening vat. The cream container is made of galvanized iron or other metal.

even better in order to produce the greatest agitation during the churning process. During the spring and summer months the grass consumed by the cows gives a yellow color to the butter so no color is added to the cream in those seasons. The reason for adding color at other times is to turn out a uniform product throughout the year; a product lacking uniformity is not readily marketed. The color used should be a vegetable dye made from the *annatto* plant. The required amount ranges from a trace to as much as three drops per pound of butter obtained.

When the churn is first started gases produced in the cream cause a high pressure in the churn, and should be let out by opening the air vent a couple of times. Follow the manufacturer's directions as to the speed at which the churn is operated. Most churns have a small glass window by means of which it may be told when the churning is about completed. The glass is first covered with cream but as the butter forms it becomes clear. The churning should be carried on until the butter, still in a flaky condition, appears dry and well up on the surface of the buttermilk, which should have a bluish appearance. Only few butter granules should stick to the inside or cover of the churn at this point. The granules may be round and will then be about the size of wheat kernels; if the cream has been rich in butter fat they may become rather irregular in form.

Washing, Salting, Working, and Packing

Drain off the buttermilk immediately after the churning is completed; then pour cold water (of the same temperature as the buttermilk) over the butter while it remains in the churn, using about as much water as the amount of buttermilk

The best churning temperature. The ripened cream should be held at churning temperature for 1 to 2 hours before churning, otherwise the body of the butter will be weak and slushy. This temperature varies according to the season of year, feed of animal, period of lactation, richness of cream, etc., but it should be such that the butter after churning will be firm. It usually ranges from 56 to 60 degrees in fall and winter and from 52 to 56 in spring and summer.

The churn should never be more than half full. From a third to a half full is

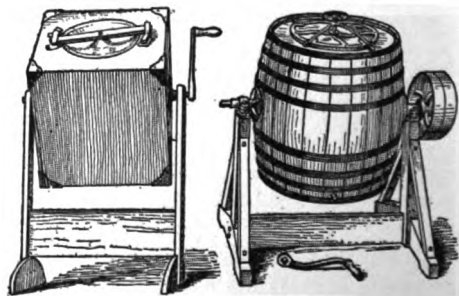
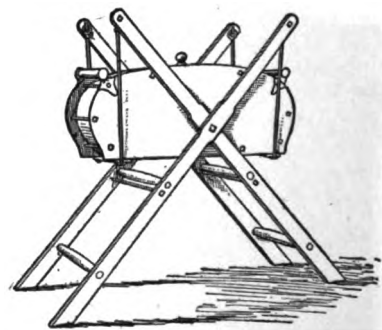


FIG. 543. Three satisfactory types of churn found on dairy farms. Above, the swinging type; below, the box and barrel types. The last is equipped for either hand or power operation.

removed. Turn the churn 6 to 10 times and drain off the water immediately. The purpose in washing the butter is to remove the buttermilk, as butter containing too much buttermilk does not keep well. The water used should be clear, pure, and free from objectionable odors and organic matter. Water from a deep well is preferable; that from a shallow well is seldom suitable.

Salting and working. The butter is ready for salting as soon as the water has drained out. The amount of salt necessary varies according to the consumer's demands, ranging from half an ounce to an ounce per pound of butter. In a general way the Eastern markets demand butter carrying 2 to 3 per cent of salt (this means about half an ounce of salt to the pound of unsalted butter) while Southern and Western markets demand a slightly higher salt content. (An ounce of salt per pound would give a butter carrying close to 5.8 per cent salt.) However, these statements and figures are very general and each butter maker must study and satisfy his own conditions and demands. If a combined churn and butter worker is used it is most satisfactory to place the butter on the rollers, cut a trench in the butter from one end of the churn to the other and distribute the salt evenly along the trench. If a separate

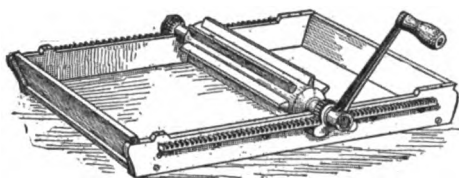


FIG. 544. One form of butter worker well adapted to the needs of the medium sized farm

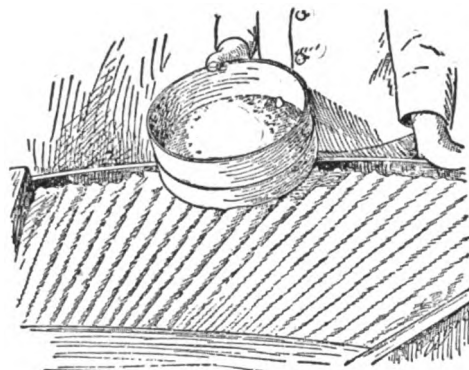


FIG. 545. In salting, the butter should be spread out and the salt sprinkled over it as evenly as possible. (N. C. Bulletin 192.)

worker is used or if the butter is worked with paddles in a mixing bowl, the salt should still be spread so that it can be readily worked into the butter without loss.

Butter is worked for the purpose of expelling moisture, and producing a firm and compact body; also for the purpose of dissolving the salt and distributing it evenly through the butter. This is most readily accomplished by first working the butter until about half finished, then leaving it for an hour or two. If a combined churn and worker is used, leave the butter on top of the rollers and close the churn; if an open worker is used it is advisable to leave the butter in water of about the same temperature as that used to wash it between workings. The butter is then worked until its body is compact but not to the point at which it becomes greasy. Butter insufficiently worked is mottled or uneven in color.

Unsalted butter is made from sour cream and worked without the addition of salt, and is sometimes incorrectly called "sweet butter," which is really butter made from sweet cream and worked without the addition of salt. The demand for unsalted butter is rather limited, coming mostly from Hebrews, although a few high class hotels serve it. During late years some ice cream manufacturers located where sweet cream is not available, have been heavy purchasers of unsalted or preferably sweet butter, which

they melt, mix with hot skim- or whole milk in definite proportions, passing the two through a homogenizer (p. 464) or emulsor, thus converting them into cream. The Southern states should offer a ready outlet for unsalted and sweet butter to be used for such purposes.

Unsalted butter is prepared in the same way as salted butter except that no salt is added; the amount of working required to give a firm waxy body is practically the same in both cases. Its price is however some-

what higher than that of salted butter, the reason being that when salt is added it is sold at a price equal to that of butter although it originally costs but a trifle. A fair estimate of the selling value of unsalted butter may therefore be found by this rule: Selling value equals the price of salted butter multiplied by 100 divided by 100 less the

per cent of salt in the salted butter; or in terms of arithmetic, value = $\text{Price} \times 100 \div 100 - \%$.

For example: if a butter containing 3 per cent salt is sold for 32 cents a pound, a pound of unsalted butter should be worth:

$$32 \times \frac{100}{100-3} = 32 \times \frac{100}{97} = 32.99 \text{ cents.}$$

Preparing butter for market. Butter should be put up in packages which are attractive as well as uniform in size and appearance. The one pound print

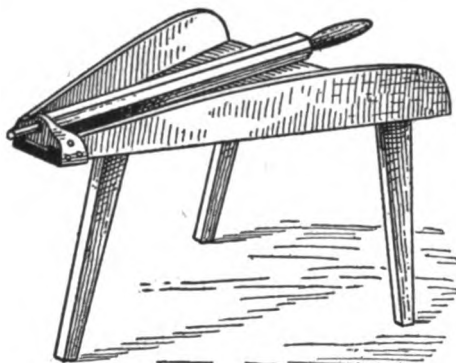


FIG. 546. Another popular form of butter worker. The corrugated roller enables the pressure to be varied to suit the texture of the butter.

$4\frac{1}{2} \times 2\frac{1}{2} \times 2\frac{1}{2}$ inches is possibly the most attractive, the least expensive to produce, and the most convenient form for both consumer and producer. For bringing butter into this shape a small hand mold or one affixed to a table may be used. It should be so adjusted that the block of butter weighs exactly a pound. The butter is then wrapped neatly in a parchment paper bearing the farm's name or trademark or the name of the butter.

Glazed stone jars with a parchment paper on top are used quite extensively in supplying local demands. They provide a serviceable and sanitary package, but are too heavy for shipping and involve too great danger of breakage.

For distant markets fibre boxes which may be packed in crates of different sizes are better, or even the regulation wooden tubs holding 5, 10, 20, 30, 40, 50, and 60 pounds.

Churning Troubles

The buttermaker is best satisfied when churning takes from 30 minutes to an hour, but at certain times, especially in the fall, the cream appears to churn less easily and may take several hours. This difficulty may usually be traced to one of the following causes:

Cream from stripper's milk. A cow far along in her lactation period produces milk containing comparatively small fat globules that are gathered in churning only with great difficulty. It is not within the power of man to correct this.

Feed of the cows. A succulent feed such as grass produces a softer fat than dry feed and difficult churning is often experienced when the cows are changed from green to dry feed. This defect may be remedied by continuing to feed the cows succulent feeds or those rich in oil.

Acidity of cream. Cream that has been properly soured churns more readily than sweet cream; it is therefore especially important that cream be properly ripened during fall and winter.

Richness of cream. A very rich cream will

often stick to the sides of the churn, preventing proper concussion and thus causing slow churning. If the cream is too thin the fat globules are so scattered that they are collected with difficulty. A cream containing from 30 to 40 per cent fat may be considered most satisfactory.

Temperature of cream. When the fat globules are small and hard this should be increased; hence it is that the best winter



FIG. 547. The one pound print is the commonest and most popular form in which to retail butter. The wrapper should carry the farm or creamery trademark.

churning temperature is from 56 to 60 degrees while the summer figure is from 52 to 56.

rinsed with hot water and finally boiled for a few minutes.

Cleaning the Churn and Utensils

The churn should be washed immediately after it is used. If it is of wood, rinse it first with lukewarm water to remove the buttermilk and butter particles. Then fill it about a third full of boiling water to which washing powder free from soap, or slaked lime has been added, and either revolve it at a reasonably high speed for 4 or 5 minutes or wash it on the inside with a brush. After removing this water, use more hot water to rinse it, then drain this off and leave the churn to dry without a cover and with the opening upward. Wash the outside with warm water and soap since washing powder will dissolve the paint. In washing a stone churn use water of a somewhat lower temperature as boiling water may break it.

All utensils such as paddles and butter printer should also first be rinsed in warm water, then washed with hot water, washing powder, or slaked lime and a good brush,

Storing Butter for Home Use

Butter may be stored on a small scale in a strong brine. Put it up in rolls of any form or size, wrap these in parchment paper and place them in some water tight vessel—a thoroughly cleaned barrel or a stone jar is the most satisfactory. As soon as any of the butter has been placed in the container, cover it with a brine prepared by adding $8\frac{1}{2}$ pounds of clean butter salt to each 10 pounds of water, mixing them in a churn, and churning them for from 10 to 15 minutes to properly dissolve the salt. Cover the vessel tightly and keep it in a cold cellar. Butter thus prepared may keep reasonably well for as long as 6 months.

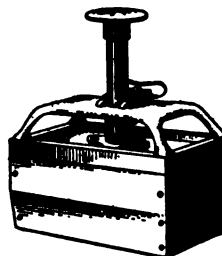


FIG. 548. A one pound butter print mold

BUTTER MAKING IN THE CREAMERY

It is estimated that at present more than half the butter produced is made on farms. The tendency, however, is becoming more in favor of the creamery, mainly because it removes much hard, tedious work from the farm. The creamery operator makes a more uniform product which sells readily, returning to the producers a better price than they could obtain by making the butter themselves.

Where can a creamery be operated? The advisability of establishing a creamery should be determined largely by the amount of raw material available in the locality. In Iowa it is felt that cream should be available from not less than 600 to 800 cows for the successful operation of a creamery; in Wisconsin, according to Farrington, one should not be started with less than 400 cows. The price at which the farmers are able to dispose of their products without the assistance of a creamery is also a factor worthy of consideration; if low, it may be desirable to start a creamery with comparatively few cows. It is advisable that farmers of any section consult the dairy department of their experiment station before definitely deciding whether or not to start a cooperative creamery.

The cost of a creamery. A building with 30 x 60 feet of floor space properly used will handle the cream from 600 to 1,200 cows. But it may be considered the logical size to erect even though the creamery starts with less cows than this, since it is wise to provide a plant to meet future needs. The modern creamery should be of brick, hollow tile or concrete; the frame structure lacks in sanitation and durability. Brick and cement blocks make a serviceable combination, the bricks on the outside giving the building a nice appearance, and the hollow tile being just as durable when used inside and plastered with cement. The tile may also be used for

all partitions. A 30 x 60 foot building so constructed, with a brick chimney, will cost from \$3,000 to \$4,000; machinery and equipment will cost about \$2,000 more. An ice house may be cheaply constructed for about \$500 or an insulated one for about \$1,500, practically what it would cost to install a refrigerating plant to take its place. When organizing a cooperative creamery, it is considered advisable to have \$7,500 subscribed, which will erect such a plant and usually leave about \$1,000 for working capital.

Cooperative creamery organization. The creameries generally known as cooperative



FIG. 549. The wooden tub is still the commonest container for the commercial shipment of butter.

are either on a strictly mutual coöperative basis, or more often, the organization is what is known as a joint stock company. The main difference between the two is that in the former there is no capital stock upon which to declare dividends whereas in the latter dividends are declared.

The mutual coöperative organization is gaining in favor. Money for the establishment of the creamery may be subscribed by farmers or business men, each of whom obtains a note from the creamery for the amount subscribed. This note bears a definite per cent of interest and in addition its holder receives annually a definite amount of the principal until the face value has been paid, when the note is returned to the creamery. For the payment of such money the creamery creates a sinking fund by retaining a definite amount of money per pound of fat handled, ranging usually from one-half to one cent per pound. All patrons of such a creamery receive the same price per pound of fat delivered regardless of whether or not they subscribed to the original fund for the erection of the plant (that is took its notes). Furthermore a patron becomes a member of the organization and has a vote in all matters pertaining to the business.

The coöperative creamery is managed by a board of (usually 5 to 9) directors which elects its own president, vice-president, secretary, and treasurer; the first two are usually members of the board of directors. This is not always the case with the secretary and treasurer who, however, should be men of business experience. The directors should be elected with the object of having them reasonably well distributed over the territory tributary to the creamery so they may act as special agents among their neighbors to secure and retain their patronage.

Cost of manufacturing butter. The cost of manufacturing depends largely on the size of the creamery. If the receipts of raw material are small, the cost of manufacturing a pound of butter will naturally be high because of fixed expenses which cannot be

reduced. The cost of manufacturing a pound of butter in Iowa creameries has been estimated as follows:

IN A CREAMERY MAKING	COST IS
40,000 pounds.....	4 cents
50,000 ".....	3.4 "
60,000 ".....	3.0 "
70,000 ".....	2.88 "
80,000 ".....	2.66 "
90,000 to 125,000 pounds.....	2.00 "
150,000 pounds.....	1.85 "
175,000 ".....	1.65 "
200,000 " and above.....	1.44 "

This cost should be largely paid for by the overrun, by which is meant the *amount of butter manufactured in excess of the amount of butter fat used*. The overrun is therefore made up of the other ingredients than the butter fat.

The composition of normal American creamery butter (Bulletin 149, Bureau of Animal Industry) is:

Fat.....	82.41	per cent.
Moisture.....	13.90	" "
Salt.....	2.51	" "
Curd.....	1.18	" "
Total.....	100.00	" "

The overrun obtained in a creamery should be in the neighborhood of 20 per cent; it may be determined by the following rule or formula, in which P is the per cent of overrun, B, the pounds of butter obtained and F, the pounds of butter fat used:

$$P = \frac{B - F}{F} \times 100$$

For example, to determine the overrun when 828 pounds of butter is produced from 690 pounds of butter fat, we have

$$\frac{828 - 690}{690} \times 100 = 20 \text{ per cent overrun}$$

The value of the overrun increases as the value of the product increases. For example, suppose a creamery obtains an overrun of 20 per cent. The value of this, if the butter is worth 25 cents per pound, is equal to

$$25 \times \frac{20}{100} = .5 \text{ cents per pound of butter}$$

produced. But if the butter is worth 35 cents per pound then the overrun is worth

$$35 \times \frac{20}{100} = 7 \text{ cents per pound of butter.}$$

Method of manufacturing butter in a creamery. The methods of manufacturing butter in a creamery are much the same as the methods employed in the farm dairy except that the machinery and equipment are usually of different types designed to handle larger volumes of cream, etc. There should, however, be one operation added for the factory system of manufacturing, that of pasteurization. In the factory milk is handled from different herds and from various sources. It is quite possible for milk from a diseased herd to be delivered to the creamery,

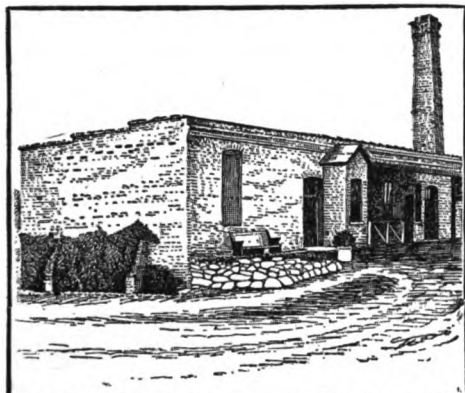


FIG. 550. A typical Iowa creamery which can relieve its patrons of much labor and produces, at lower cost than they could, a superior product.

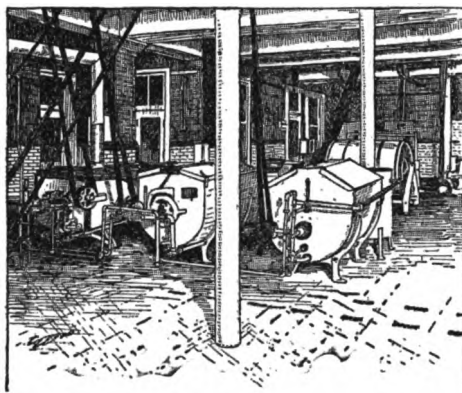


FIG. 551. Inside a typical Iowa creamery, showing modern provisions for handling large quantities of milk, quickly, efficiently, and in a sanitary manner.

or for the milk to be contaminated by other organisms causing human diseases such as typhoid fever, scarlet fever, diphtheria, etc. Pasteurization destroys such organisms and butter produced from pasteurized cream may be considered an absolutely safe product. The temperature employed in pasteurizing cream should be from 140 to 145 degrees for a period of from 20 to 25 minutes or from 180 to 185 degrees in the flash (instantaneous) system.

The container used by most creameries for shipping butter to Eastern markets is the 60 or 63 pound tub. Western markets prefer what is known as the Australian box, 12×12×12 inches in size, holding 56 pounds of butter. This is also used for butter marketed in Europe. Its advantage is that butter so packed may be more readily cut up into prints.

The most commonly used print in this country weighs 1 pound and is $4\frac{1}{2} \times 2\frac{1}{2} \times 2\frac{1}{2}$ inches in size, although special prints are found to a greater or less extent throughout the country. On the Pacific Coast there is used quite extensively a 2-pound print and also a quarter-pound print put up in different shapes; there is also a limited demand for this latter size in the large cities. One pound prints are usually shipped in boxes holding from 5 to 50 pounds each, but other special sizes are used to a greater or less extent.



FIG. 552. Types of cheese made in America. *a* Roquefort; *b* Swiss; *c* American or Cheddar; *d* Brick or Brie; *e* Camembert; *f* Cream; *g* Stilton; *h* Bowl of home made cottage cheese.

CHAPTER 44

Cheese Making at the Farm and Factory

By PROFESSOR J. L. SAMMIS of the Dairy Department of the University of Wisconsin, who began his dairy experience as a lad by milking and taking care of the family cow. Later, during his college vacations, he carried on successfully the pasteurization and marketing of the output of the college herd, thus becoming familiar with the practical problems that confront the milkman. For a time he was connected with the U. S. Department of Agriculture as dairy expert, and since 1906 he has been a professor in the University of Wisconsin. With Wisconsin as the leading cheese producing state he has been able to give particular attention to this phase of the dairy industry, especially with relation to practical, everyday cheese making problems; but he has also made careful and extensive studies of both dairy conditions and methods of practical instruction throughout the rest of the United States and Canada. His technical training as a chemist at the University of Illinois was especially along the line of food investigations, including the study of milk and its products. He has prepared numerous articles and bulletins on cheese making and other dairy topics, and is ready to supplement the following material with assistance in solving the problems of any practical dairymen who may care to consult him.—EDITOR.

YEARS ago all the cheese that was used was made on farms. But as more and more was needed to supply the world's market, cheese making, like butter making, weaving, milling, and other industries, became a factory proposition. To-day about all the cheese made on American farms is an occasional cheddar for home use and, more often, some sort of soft, uncured cheese of the cottage, buttermilk, or Neufchatel type. These are easily made, disposed of while fresh, and provide both a pleasant food and a good way to use up a surplus of skimmilk, buttermilk, or whole milk that is too small to be marketed and too good to throw away.

How to Make Cheese on the Farm

Skimmilk cottage cheese to be good both for home use and sale should be clean in looks and flavor, evenly salted, and wholly free from grit. Fresh, clean skimmilk must be used. First warm the skimmilk in a large tin or graniteware pan to blood heat (from 90 to 100 degrees on an ordinary thermometer), and let it stand warm until sour and thick. If a pint of sour milk or well-stirred clabber is added to every gallon of the skimmilk it will thicken at 90 degrees in about half a day. A quarter of a pint of starter per gallon will give the same result in about 24 hours.

After the milk is thick stir the curd with a fork to break it into small pieces. Allow it to stand quiet and warm for half an hour, then pour it into a muslin bag or flour sack and hang it up to drain. If the curd is broken into too small pieces and then heated too hot or left standing too long before being put in the bag, it will become dry, tough and hard, and the cheese will be poor. The bag of curd

may drain all night or merely until it is cool and dry enough to handle when it is salted. Use one ounce of salt to every $4\frac{1}{2}$ to 5 pounds of cheese, mixing it evenly and thoroughly. Some people like to add at this time a little cream or butter to increase the smoothness, or finely chopped onions, chives, parsley, or green pepper to add a special flavor. Some prefer to hang it in a warm place to drain, while others tie the bag outdoors where, they say, the sun and wind improve its quality. One hundredweight of skim milk will make 16 or 17 pounds of cottage cheese or a little more if the product is very soft and moist.

Buttermilk cheese, made from the buttermilk obtained by churning ordinary sour cream is even easier to make than cottage cheese; the yield is only about 12 pounds per 100 pounds of buttermilk. Creamery buttermilk can be used *except* when obtained from a creamery that pasteurizes its cream while sour just before churning. Set the buttermilk on the stove in a tin or enameled pan and heat it scalding hot (130 to 140 degrees) without stirring or, if at all, only once every 5 minutes, and then gently. The curd will form and rise around the sides of the pan with a sort of crinkly appearance and should be left in fairly large pieces. When a temperature of 130 to 140 degrees is reached, take the pan off the stove and let it stand quiet for about an hour. Then pour first the clear whey and then the floating curd into a draining bag or on to a flat draining rack covered with muslin or cheesecloth. Leave the curd to drain for several hours until dry and cool, then salt with the same amount of salt as used in skim milk cheese.

There is no danger of this cheese getting too dry or gritty, but *never use zinc or galvanized iron vessels* for sour milk or buttermilk as the acid will soon eat into them and dissolve tiny bits of the metal which will be taken up by the cheese making it unfit for food.

The Neufchatel cheese making process may also be used on the farm either with skim or whole milk; it gives a very smooth, fine-grained cheese. Mix the milk at a temperature of about 75 degrees, with a small amount of junket tablet dissolved in water and leave it to thicken. The directions on the package of tablets will tell how much to use to make the warm milk thicken in about 2 hours. Let the milk stand over night at about the same temperature so that it will sour slightly, then break and stir the curd with a fork and pour it at once into draining bags, putting not more than 2 gallons in each. Hang the bags to drain over night, shaking them well every few hours to start the whey running again. Next morning press the bags of curd for 15 to 30 minutes in a cider press or under a board and weight, to remove any free whey. When dry enough weigh and salt. When skim milk is used the draining is more rapid than when whole milk is used.

Pimento cheese is made from cottage buttermilk, or Neufchatel cheese by adding to every 10 or 15 pounds with the salt, half a pound of finely ground, canned Spanish pimento (a kind of red pepper) which gives a red color and attractive flavor.

Cheddar cheese, known even better as American, has become the leading

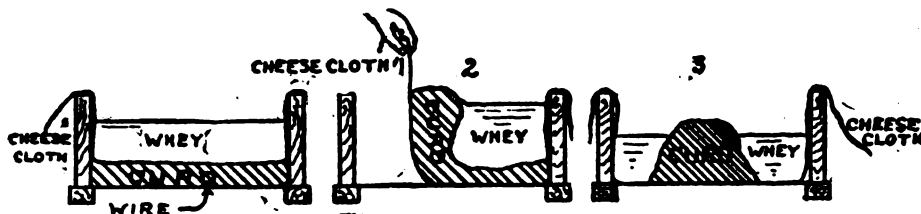


FIG. 553. How to hasten draining of cheese curd. Lift the cloth first at one side of the draining board and then at the other, so as to pile the curd in the centre and let the whey run off more freely

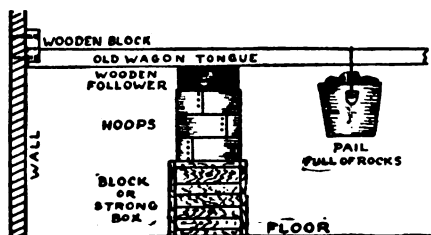


FIG. 554. A cheese press that can be made on any farm. The pail of rocks can be moved along the wagon tongue to increase the pressure.

normal whole milk, or as they are sometimes called, "full cream" cheeses, sell at the same market price, whether made from milk with 3 or 4 per cent or more butter fat. To make Cheddar cheese on the farm, mix sweet night's and morning's milk and heat to 86 or 90 degrees. Then mix rennet extract, junket tablets, or a piece of calf's stomach evenly through it when it will become thick after standing quiet for 10 or 15 minutes. Half an hour later, cut the curd into half inch pieces with a knife, fork, rake, wire toaster, or regular curd knife, then stir it gently for half an hour while heating it slowly to about 100 degrees. Leave it for 1 or 2 hours longer stirring frequently until the curd is firm and elastic, and springs apart readily, after being squeezed gently in the hand. Drain off the whey and stir the curd while cooling it to about 90 degrees. Next stir $2\frac{1}{2}$ pounds salt per 1,000 pounds milk, or 100 pounds curd, evenly through it, and after half an hour put the curd in a cloth-lined hoop, cover it with a block and put it in the press, which may have a screw like a cider press or be made with a weighted lever. Next day take the cheese out and after the surface is well dried, grease it all over to prevent cracking. It may be eaten in from 2 to 8 weeks, as preferred, but is not suitable for putting on sale in stores. One hundred pounds of 3 per cent milk will make about $8\frac{1}{2}$ pounds of cheese; the same amount of 4 per cent milk will make $10\frac{1}{2}$ pounds, and of 5 per cent milk, very nearly 13 pounds.

Commercial Varieties of Cheese

More than 250 varieties of cheese are made in different parts of the world. Some, like cottage cheese, are ready for use immediately after making, but most sorts are cured or ripened for several weeks or months in a curing room, cellar or cave, under suitable conditions of temperature and moisture, until they develop the right flavor, texture, etc. For cheese making, cow's milk is generally employed, but, especially in foreign countries, the milk of sheep, goats, buffalo, reindeer, etc., is used to a limited extent. The well-known differences in flavor and texture between American, Swiss, Limburger, and other varieties that are all made of cow's milk are due mainly to variations in the acidity or ripeness of the milk used, the proportions of moisture and fat in the finished cheese, and, especially the different temperatures, methods of salting and manner and time of curing. The basis of all cheese is the casein or curd of the milk; the amount of fat present may vary widely according as skimmilk, whole milk or cream is used to begin with. The process of making any kind of commercial cheese resembles in a general way that given above for making Cheddar, with such variations as may be necessary to get the particular results desired.

Commercial Cheddar cheese is made mainly in Wisconsin and New York but to some extent in Michigan, Minnesota, Dakota, along the Pacific Coast and in a few other small

commercial sort in this country, but it is still made on a small scale on some farms. Whole milk only is used in making it in Wisconsin and Canada, and mostly elsewhere. In a few states, however, skimmilk may be used, and the cheese so made offered for sale, but only if clearly labeled "skimmilk cheese" as provided by law.

Although the richer the milk the more fat there will be in the cheese, all more fat there will be in the cheese, all sell at the same market price, whether made from milk with 3 or 4 per cent or more butter fat. To make Cheddar cheese on the farm, mix sweet night's and morning's milk and heat to 86 or 90 degrees. Then mix rennet extract, junket tablets, or a piece of calf's stomach evenly through it when it will become thick after standing quiet for 10 or 15 minutes. Half an hour later, cut the curd into half inch pieces with a knife, fork, rake, wire toaster, or regular curd knife, then stir it gently for half an hour while heating it slowly to about 100 degrees. Leave it for 1 or 2 hours longer stirring frequently until the curd is firm and elastic, and springs apart readily, after being squeezed gently in the hand. Drain off the whey and stir the curd while cooling it to about 90 degrees. Next stir $2\frac{1}{2}$ pounds salt per 1,000 pounds milk, or 100 pounds curd, evenly through it, and after half an hour put the curd in a cloth-lined hoop, cover it with a block and put it in the press, which may have a screw like a cider press or be made with a weighted lever. Next day take the cheese out and after the surface is well dried, grease it all over to prevent cracking. It may be eaten in from 2 to 8 weeks, as preferred, but is not suitable for putting on sale in stores. One hundred pounds of 3 per cent milk will make about $8\frac{1}{2}$ pounds of cheese; the same amount of 4 per cent milk will make $10\frac{1}{2}$ pounds, and of 5 per cent milk, very nearly 13 pounds.

sections. Its production is increasing, but only about a third as fast as the population so there is a big opportunity for increase in both size and number of cheese factories.

The moisture in American cheese may vary from 34 to about 42 per cent according to market demands. The Canadian type both for home use and export to England runs from 34 to 36, is firm, slow curing and quite solid. In Wisconsin much cheese has recently been made for Southern trade which takes a little softer, moister, faster curing product. A really soft cheese (with more than 40 per cent of moisture) such as "Michigan soft" and New York "soaked" curds, is unfit for long storage, as from fall to spring, or for shipment to warm climates, and the market for it is limited.

By the use of different hoops, cheeses are made of different shapes and sizes including the standard Canadian export type, 15 inches in diameter and weighing about 85 pounds; "flats," about the same diameter but lower and weighing about 30 pounds; "daisies," 13 inches in diameter, 5 inches high and 20 pounds apiece; and such retail or family sizes as "Long Horns," "Young Americas," 10 pound, and 5 pound squares. Smaller sizes have not proved satisfactory owing to the increased labor and the excessive shrinkage. But on the other hand, cheese for exhibitions have been made to weigh as much as 12,000 pounds!

A "white" cheese for special trade results when no artificial color is added to the milk, but for the general market cheese is always colored by adding to 1,000 pounds milk $\frac{1}{4}$ to 1 ounce of vegetable cheese color extract. Sometimes green or green and white "sage cheese" is made by adding sage extract or other suitable coloring and flavoring material to some or all of the milk. The red mottled color sometimes seen is due to the addition of pimento peppers when salting the curd. The Wisconsin Experiment Station has found that curing at a low temperature improves the quality of cheese and this method is being followed more and more widely. Particular consumers prefer a cheese that has reached its best condition after, say 6 or 12 months of curing, but a considerable demand has been made in recent years for younger, milder cheeses, that are often 4 weeks old or less.

Swiss, Brick, and Limburger cheese are the most important sorts after Cheddar. The former, though still largely imported is now made at some 400 factories in southern Wisconsin. For Swiss cheese fresh milk, warm from the cow is delivered twice a day at the factory, and thickened with rennet in a round copper kettle holding 2,500 or 3,000 pounds. After the curd is cut and heated finally to about 130 degrees, it is dipped out of the whey in one or two portions by means of a large square of coarse linen cloth, which, after draining for a few seconds, is lowered into a round hoop, about 36 inches in diameter and 6 inches deep. The large, round flat cheese thus obtained is called a wheel or drum Swiss and weighs 100 to 200 pounds. Smaller ob-

long cheese called block Swiss, weighing about 20 pounds, are made at some factories. The Swiss cheeses are cured for 2 to 6 months in cellars at temperatures between 65 and 90 degrees and are turned over, washed and salted on the outside every other day. The temperature must be high enough to develop round holes or "eyes" which should be from 1 to 1 $\frac{1}{4}$ inches in diameter, and evenly distributed throughout the cheese. The salt improves the flavor and texture and prevents excessive fermentation and growth of too large eyes. Imported cheeses usually retail in this country for a third to a half more per pound than domestic Swiss, mainly because of the greater care used and time spent in curing them.

Swiss cheese is made quite dry and is therefore slow curing, but Limburger from the same fresh, sweet milk is made to contain more moisture, so that it is much softer. In curing, the interior becomes as soft as butter or thick cream. In the home the strong odor of Limburger can be largely avoided by cutting off the rind out of doors and saving only the clean interior. Limburger is made in 1 and 2 pound bricks which are salted, washed or rubbed in the warm, moist curing room several times a week, and are ready for the consumer in about 6 weeks. When half ripened, they may be wrapped and packed for shipment. Brick cheese is somewhat like Limburger, but is a little drier and is put up in 4-pound or larger bricks. It does not develop a creamy interior nor so strong a flavor as Limburger in curing, and is ready for use in about 8 weeks. Swiss cheese is always made in round copper kettles, but brick and Limburger may be made either in round kettles or in the ordinary square cheese vat.

Roquefort cheese is imported from southeastern France in round flat loaves wrapped in tin foil, which when cut show a blue marbled appearance inside, and which have a somewhat peppery flavor. It is made exclusively from sheep's milk, and is cured in enormous mountain caves. The blue mottled effect is obtained by sprinkling a few moldy bread crumbs in the interior of each cheese when filling the hoops and afterward punching small holes in the rind so as to admit air, and permit the blue moulds to grow. The English Stilton, and the Italian Gorgonzola

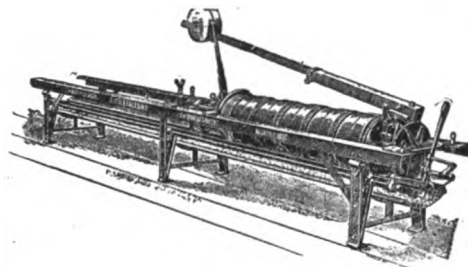


FIG. 555. One type of cheese press as used in factories



FIG. 556. An old milk can and a coil of iron pipe through which steam is passed, may be used to heat large quantities of milk in farm cheese making.

are mold ripened cheeses somewhat similar to Roquefort, but usually of lower quality.

Camembert cheese as made in north-western France and somewhat in this country is sold in small, flat, round, wooden boxes,

holding less than 1 pound. It is rather soft with a fine flavored, creamy interior. Brie is somewhat similar but may be 12 inches or more in diameter and $1\frac{1}{2}$ to 2 inches thick, and is not quite so soft inside. In their relation to each other, the two may be compared to Limburger and brick but they differ from these in being mold ripened cheese, that is ripened with the aid of a species of greenish gray mold which grows on the surface.

Edam cheese comes from Holland in cannon-ball shape and in various sizes up to about 8 inches in diameter. It is often made from partly skimmed milk, and is highly salted, and colored red on the surface.

Parmesan is an Italian cheese somewhat like Swiss, but made from skimmed milk, and very dry and hard. It is commonly grated and sold in glass bottles, but can also be obtained in loaves like drum Swiss. It is used for flavoring soups, macaroni, etc.

Cheese Making in Factories

Cheese making was begun on farms in New York State about 1800 by settlers who had learned the art in Europe, and who once or twice a year loaded their surplus stocks on ox carts trading it about the country for anything else of value. About 1845 cheese began to be exported to England in considerable quantities, this trade bringing the highest prices. As the industry grew successful cheese makers used milk obtained from their neighbors and thus began the cooperative factory system that has since widely spread and rapidly. Some of its advantages are: (1) The saving of labor, since one man at a factory can handle 5,000 pounds of milk from a dozen farms, leaving the farmers time to do other work and enlarge and improve their herds and dairy business. (2) Better cheese results because a skilled man can be employed to give all his time to its making. (3) Better equipment and curing rooms can be provided at a central factory than on the average farm. (4) Better, more uniform quality in a large daily production commands better prices from cheese buyers who are saved the trouble of visiting many farms to inspect and purchase their stock.

Cheese factory management by farmers. It is desirable that the control of a cheese factory should be in the hands of its patrons rather than a group of men from outside. The patrons of even a small factory may own between them half a million dollars' worth of land, buildings, implements and stock, while the entire factory and equipment represents less than 1 per cent of that amount.

The cheese factory vs. the creamery. Dairy farming maintains and even increases the fertility of the farm, therefore, either creamery or factory is a benefit in that it supports that kind of farming. The main difference is that in the case of the cheese factory the casein and fat are sold, while in the case of the creamery the butter fat is sold and the casein, contained in the skim milk, taken home and fed to the stock. Casein is rich in the nitrogen that is so necessary to farm fertility but this gives the creamery only a slight advantage, since clovers, alfalfa, etc., store in the soil nitrogen taken from the air.

On the other hand a cheese factory can be

started and profitably operated with about half as much milk as a creamery requires, which makes it preferable in sections just taking up dairying. Cheese, too, is better suited to manufacture at a distance from the market and there is less danger of rapid loss of quality than in the case of butter. Where patrons keep purebred cattle and can profitably raise every calf either to add to their herds or to sell, the creamery may prove best, since it gives the farmers a large supply of skim milk for feeding purposes. But where patrons keep mostly grade stock and sell most of their calves for veal, but little skim milk is needed and whey may be fed to hogs, making the cheese factory a good proposition.

Organizing a New Cheese Factory

Every step in the organization of a new cheese factory should be taken so as to insure the immediate prosperity and future growth of the enterprise. Signed agreements should be secured from farmers nearby to deliver the milk of at least 200 cows, with a good prospect of soon increasing the number. In a new dairy region, the average daily yield per cow may not be more than 10 or 15 pounds, and it is necessary to have at least 2,500 and better 3,000 to 5,000 pounds of milk daily to profitably employ a cheese maker's time.

It is an advantage, also, after organization, to sell shares in the factory building of \$10 to \$25 each to as many farmers as possible, as this will increase their interest in the factory and its welfare, and will prevent them from delivering to other buyers who may later offer equal prices for milk. As an inducement the shares should draw 6% annual interest, and in addition the charge for making 100 pounds of milk into cheese may be made slightly lower for stockholders than for others. Finally, an additional division of factory profits among shareholders may be made at the end of the year. In order to secure the highest degree of coöperation among employees and non-shareholders as well, a part of the factory profits may be distributed among them each year at a lower rate than that paid to shareholders. An incorporated joint stock company is preferable to a simple partnership, since in the latter every partner is individually liable for all the unpaid debts of the factory, but in the former the shareholder can lose only the value of his shares.

Neglect to pay shareholders a fair return on their investment has been found in some localities to result in the sale of the factory after a time to an individual cheese maker or other party, who may prefer to conduct a private factory, receiving the farmers' milk, selling the cheese, and paying them his own price for milk at the end of each month, without rendering to the patrons a detailed statement of the factory business. While this arrangement may be entirely satisfactory in some cases, yet for reasons given above, it is generally preferable for intelligent factory patrons to retain the management and control of the factory business.

The cost of making cheese. The principal expenses outside of the cost of the milk are labor and supplies, such as salt, rennet, extract color, bandages, boxes and fuel, but repairs and wear and tear of equipment should be counted in. To secure the best and most economical use of supplies the cheese maker at the factory is usually paid at the rate of 1½ to 2 cents per pound of cheese sold and required to furnish all supplies except, perhaps, fuel.

The supplies cost from ¾ to 1 cent per pound or more, leaving the maker about an equal amount for his labor. Thus a maker handling up to 5,000 pounds of milk daily may earn from \$65 to \$150 a month for his labor. Makers are sometimes simply paid by the month and given living rooms over the factory and free milk, cheese, and fuel for family use. However, the problem of securing sufficient skilled labor is a serious one.



FIG. 557. The outside of a Wisconsin cheese factory, suitable for a community (Wis. Bulletin 244).

Methods of selling cheese. In leading cheesemaking districts, it is commonly sold at a local cheese board of trade, where buyers and sellers meet regularly each week. Each factory's cheese is listed on a blackboard, and the buyers make bids on each lot until all are sold to the highest bidder. Factories at some distance from a board usually ship regularly to a buyer who has contracted to pay each week a price based on the ruling market price at a chosen cheese board. If any cheese shipped are found by the buyer to be of inferior quality, the buyer and seller agree upon a reduced price for that lot by

house and sales service is $\frac{1}{4}$ of a cent per pound on the cheese sold.

Methods of paying patrons for milk. A record is made daily on the milk sheet at the factory intake of the weight of milk delivered by each patron, in columns, which can be added up at the end of the month. The cheese are sold when about a week old and are commonly paid for within a week after sale, so that factory payments can be made once a month, covering the preceding month's milk. The payments may be figured by the cheesemaker, the factory secretary, the school teacher, or by the local banker who handles

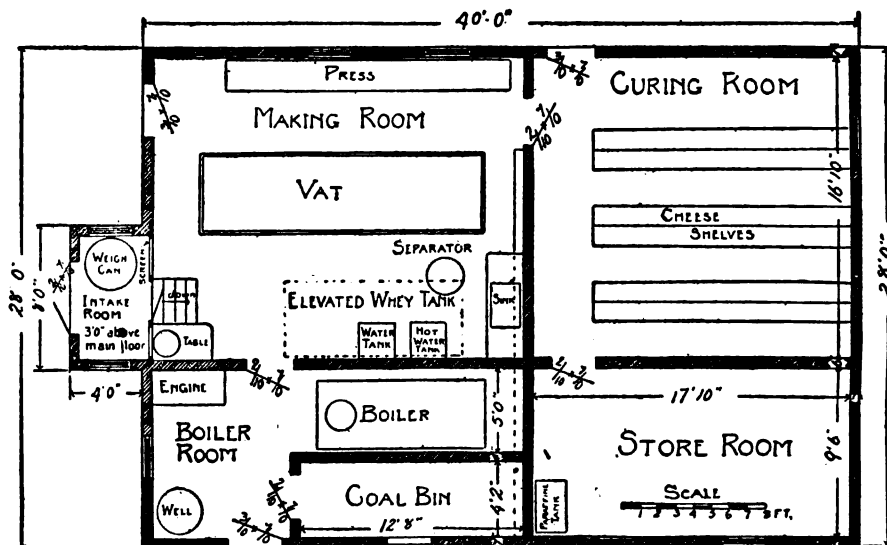


FIG. 558. Plan for a small cheese factory such as is shown in Fig. 557. This is designed to make and cure cheese from about 6,000 pounds of milk daily. (Wis. Bulletin 244).

correspondence or otherwise. Under this system, there is no competitive bidding on undergrade cheese, and in addition buyers can never know until the cheese reach the warehouse, how large a proportion of the shipment will be of satisfactory quality for the best trade. These two difficulties are avoided entirely in the Quebec cooperative system of cheese selling under which 250 factories ship cheese regularly to a central warehouse in Montreal where the cheese are graded as to quality by expert judges, and each grade is sold according to quality, at auction, to the highest bidder.

In Sheboygan County, Wisconsin, a Cheese Producers' Federation, consisting of the patrons at about 50 factories, owns and operates a cheese warehouse and cold storage plant. The manager receives the cheese shipped each week from each factory, sells them in the market, and reports the weights shipped and the proceeds from the sale of each factory's cheese to its secretary. The cost of the ware-

house and sales service is $\frac{1}{4}$ of a cent per pound on the cheese sold.

The total receipts of money from the sale of cheese are added up, the total expenses including the cheesemaker's pay are subtracted, and the remainder is distributed among the patrons on some prearranged basis, the actual method being always a live topic among cheese factory patrons.

The pooling system. At the first cooperative cheese factories in 1850, all patrons were paid for their milk at the same rate per hundred pounds, on the assumption that the supply from one herd is worth as much as that from any other. Under this plan, called the pooling system (by which the 5 patrons in the example below would each receive \$1.59 per hundredweight), the temptation to skim or water milk at the farm was very great.

Since the invention of the Babcock test at the Wisconsin Agricultural Experiment Station in 1890, it has been recognized that the

milk from different herds differs in its cheese-making value, depending on its richness in cheesemaking solids. Casein is necessary for making cheese, but since fat is the *most abundant* cheese solid in milk, the Babcock test for fat in milk gives accurate measure of the richness and value of each patron's milk. Where the Babcock test is used, there is also

no temptation to adulterate milk, as patrons are paid according to the weight of fat in the milk delivered, and not according to the weight of the milk itself.

The method commonly used at present in figuring payments to patrons by the fat test method can be shown by a simple example:

Patron No.	1	2	3	4	5	Total
Weight of milk, lbs.	100	100	100	100	100	500
Fat test of milk,	8.0	8.5	4.0	4.5	5.0	
Weight of fat, lbs.	3.	8.5	4.0	5.0	5.0	20.

The 500 pounds of milk gave 53 pounds of cheese which sold so that \$7.95 were to be divided among the patrons. \$7.95 divided by 20 (lbs. fat) gives 39.75 cents per pound of fat. Multiplying each patron's weight of fat delivered by this price gives the payments: \$1.19, \$1.39, \$1.59, \$1.79, \$1.99.

This method of figuring is based on the assumption that the average yield of cheese from milk of any given test is exactly proportional to the fat in the milk. For the great majority of factories and patrons, this is

practically correct, and the errors involved are so small as to be not worth noticing. Occasionally, where the patron's fat test differs by more than .5% fat from the factory's average test for the month, the error in the patron's payment figured by this method becomes large enough to deserve attention. In such cases some modified method of figuring the payments is used. A satisfactory plan consists of adding .6 per cent to each patron's recorded fat test, although several other plans have been devised and are used more or less.

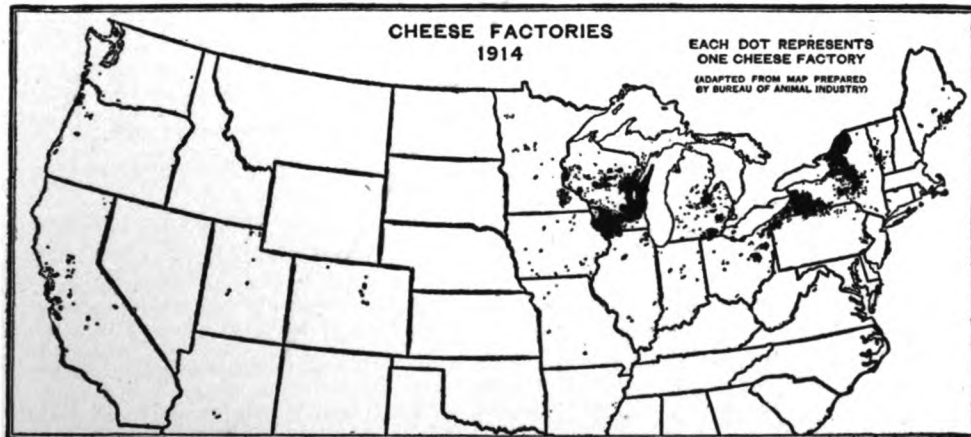
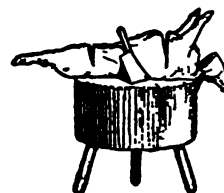


FIG. 559. Cheese factories and creameries are naturally found distributed over much the same sections. An admirable opportunity is offered the country to increase its cheese industry. (1915 Yearbook, U. S. Department of Agriculture).



CHAPTER 45



The Farmer's Meat Supply

By PROFESSOR W. H. TOMHAVE, of the Pennsylvania State College, whose specialty is the care and handling of livestock with particular reference to their value from the butcher's standpoint. He was born and reared on a western Minnesota farm; he graduated from the School and College of Agriculture of that state; and while a student at the latter he had charge of all meat work at the former institution. After gaining practical experience in a packing plant and having charge of the meat demonstration work at the St. Louis World's Fair, he began the teaching that he has since carried on, first in the University of Minnesota and now in the Pennsylvania State College, where he is also in charge of the Animal Husbandry Department. The modern cry is for economy; the farmer is fortunate in being able to respond to this appeal and still feed himself and his family on the fat of the land. The home preparation of meat products is one of the most effective means to this end.—EDITOR.

THE slaughtering of animals for farm consumption is real economy. It is evident that the first cost to the farmer of animals raised on the farm is lower than the price paid by the local meat dealer. The farmer can use all the edible by-products, such as heart, liver, tongue, etc., and can sell to advantage the more important non-edible by-products, such as hides, tallow, etc.; consequently he can prepare a carcass at a much lower figure than he could buy it at retail. He can also obtain meat of better quality by slaughtering animals that are properly fed, and sending the poorer ones to market.

Slaughter only healthy stock. The Annual Reports of the Meat Inspection Service state that each year a certain percentage of all animals slaughtered in packing plants are diseased and therefore condemned, the carcasses being pronounced unfit for food. It is probable that animals slaughtered locally or on farms are just as subject to disease and that an equally large percentage of these is affected by disease. It is important, therefore, that the farmer examine the vital organs of the stock he slaughters (especially cattle and hogs) in order to determine whether or not his animals are healthy and fit for food.

The presence of tuberculosis, the common disease of cattle, is easily detected by an enlarged condition of the glands along the neck, lungs, or intestines which may be filled with hard, cheesy, or slimy matter. If such conditions are found, have a competent veterinarian pass on the condition of the whole carcass. Slight traces of the disease will not render the carcass unfit for food; however, for safety any questionable animal should not be slaughtered at home, but should be sold where it will be competently inspected.

When to butcher. It is not desirable to have much fresh meat on hand long during warm weather. Lamb, mutton, and veal may be slaughtered at any season and the carcass easily used up in a short time. The year's supply of pork should not be prepared until cold weather sets in and beef is better slaughtered then since part of the carcass can be frozen, or kept for a long time at a temperature near freezing. For such a purpose the carcass must have some external fat; lean carcasses tend to dry out too rapidly. Alternate freezing and thawing of meats is objectionable, as it reduces the firmness of meat, and makes it loose and flabby. Coöperative meat clubs or "beef rings," (p. 495) help solve the problem of a beef supply during the summer.

During warm weather the farmer must cool the carcass as rapidly as possible and keep it away from flies. The quicker the body temperature is removed, the more thorough is the cooling process. In this connection it is best to slaughter the lighter weight animals during mild weather rather than the heavy ones which cool more slowly, even though the yield may not be as high.

Carcass Yields

The market value of live animals is based on their yields of finished products when put through the slaughtering process; that is the number of pounds of carcass meat secured for every 100 pounds live weight. Certain waste parts (offal) have some value and are also taken into account when figuring the actual cost of a carcass.

The wide variation in the yield of different classes of livestock is brought about by the differences in type, condition (degree of fatness) and the weights of the animals. Compact animals produce high yielding carcasses; those that are paunchy and long coupled, the

opposite. The greater the amount of flesh and fat, the higher the yield of carcass. Heavy animals always yield the highest carcass percentage since the per cent of offal does not increase in proportion to the increase in body weight. Cattle yield from 42 to 70 per cent carcass to live weight, with an average for all grades of about 55 per cent; hogs yield from 72 to 88 per cent, averaging about 80; sheep range from 42 to 65 and average about 50; while calves range from 45 to 65 per cent.

Hog figures. The following average figures for 36 medium weight hogs show how dressing percentages are worked out and also what may be expected in the different forms of product:

	LIVE WEIGHT	CARCASS	PAUNCH AND CONTENTS	INTES- TINES	LIVER	PAUNCH FAT	HEART AND LUNGS	TONGUE
Weight....	185.17	149.41	6.16	14.70	3.36	.62	3.16	.58
Per cent of live weight	95.24	80.02	3.45	7.60	1.76	.33	1.78	.30

The total percentage of carcass to live weight (95.24) shows that there is a loss of 4.76 per cent in the form of blood, hair, etc., that cannot be recovered. The average dressing percentage of these 36 hogs (80.02) is obtained by dividing the average weight of the dressed carcasses (149.41) by their average weight on the hoof (185.17) and multiplying by 100.

Assuming that these hogs cost 10 cents a pound, the financial statement would be:

AVERAGE COST PER HEAD	CREDIT BY-PRODUCTS
Original 185 lbs. at 10 cents..... \$18.50	Liver.... .27
Slaughtering..... .50	Heart.... .05
	Tongue... .05
	Fat..... .08
\$19.00	.40

Net cost of carcass \$18.60.
Divided by weight (149.4)—cost per pound of carcass—12½ cents.

Cattle figures. The method of figuring in the case of cattle is practically the same as for swine, except that there is more offal on account of the loss of the legs, head and hide, all of which are, however, marketable. The following figures were obtained from a group of 6 steers weighing 7,734 pounds, or an average of 1,289 each, and costing \$719.20, or about \$9.30 per 100 pounds.

	AVERAGE RECEIPTS FOR OFFAL	TOTAL VALUE
Hides.....	92.3 lbs. @ \$.14	\$12.92
Fat.....	45 " " .05	2.25
Liver.....	9 " " .09	.81
Heart.....	1 " " .25	.25
Tongue....	1 " " .30	.30
Rounds....	2 " " .15	.30
Casings....	1 " " .25	.25
Head Meat.	6 " " .09	.54
Tripe.....	1 " " .50	.50
		\$18.12

Average weight of steers . . .	1,289	pounds
Average cost per 100 pounds \$	9.30	
Cost of steer	119.88	
Cost of killing	1.50	
Total cost	121.38	
Receipts for offal	18.12	
Net cost of carcass	103.26	
Weight of carcass	749	pounds
Dressing percentage	58.5	per cent.
Cost per pound of carcass . .	13.8	cents.

Cost of lamb 75 pounds	
10 cents	\$7.50
Cost of killing . . . . .	.25
Total Cost	\$7.75
Heart, liver and tongue . .	\$.15
Pelt	2.25
	\$2.40
	\$5.35

It will be noted that the cost per 100 pounds of dressed carcass is governed by the dressing percentage which is therefore a very important factor. Let us assume that the 1,289 pounds steer dressed 50 instead of 58.5 per cent and that the receipts for the offal were the same. Then the carcass would weigh 645 instead of 749 pounds; the cost per 100 pounds of carcass (at the same price on the hoof) would be \$16.01 instead of \$13.80. The net cost of the finished product is governed by the cost of the animal on foot, the dressing percentage and the sum realized from the by-products. When the price of by-products, such as hides, is high, the net cost of the carcass is reduced. If the 92.3 pound hide had been rated at 20 cents per pound, the total receipts from the by-products would have been \$23.66 instead of \$18.12, which would have reduced the net cost of the carcass about three quarters of a cent a pound.

The large livestock packing concerns have come to regard the value of the by-products of their business as an important factor in determining the prices paid to producers and in fixing the cost of meat to consumers.

Sheep figures. The following table gives similar data for a lamb weighing 75 pounds and sold at 10 cents per pound:

Carcass weight	37.5 lbs.
Yield (dressing percentage)	50
Cost per pound of carcass	.143c

Retail prices. These vary so greatly that it is difficult to give any rule for estimating them. The local demand for the different cuts is an important factor. Steaks and chops usually sell for about double the amount paid for boiling pieces, while roasts sell for about double the price of stewing meat. In local markets a margin of about 25 per cent is usually figured.

Meat Values

The market value of meat depends upon quality, conditions under which it is handled, and the profit that is to be realized from the operation. It is estimated that a local dealer must add about 25 per cent to the wholesale cost of the meat in order to do business on a profitable basis. The approximate percentages of the weights of the different wholesale beef cuts obtained from the carcasses already discussed under carcass yields, and their values are given in the following table. The carcass taken as an illustration weighed 749 pounds and cost, after allowing for by-products \$103.80, or \$13.80 per 100 pounds.

	LOIN	ROUND	FLANK	SHANK	CHUCK	PLATES	RIBS	SUET
Average per cent of weight . . .	17	23	4	4	26	13	9	4
Average per cent of value	25	24	2	2	24	10	12	1
Weight of cut (lbs.)	127.3	172.3	30	30	195	98	66.4	30
Wholesale (farm) cost per lb.	20.3c.	14.4c.	6.8c.	6.8c.	12.7c.	10.5c.	18.66c.	3.44c.
Retail cost (wholesale plus a quarter)	25.37c.	18c.	8.5c.	8.5c.	15.87c.	13.1c.	23.32c.	4.3c.

Butchering on the Farm

The outfit needed. It is not necessary to invest a large sum of money in the equipment for farm butchering. If many animals are to be handled it may be advisable to construct a simple building where the slaughtering can be

done and the carcasses worked up into the various cuts and by-products. Otherwise a small building or tool shed may be used, or, if no building is suitable, the work may be done out of doors.

Simple tools will suffice and permit good work in the preparation of carcasses, both for market and home use. A 6-inch sticking knife sharpened on both sides of the tip can be purchased at a local hardware store for 30 or 35 cents and is more convenient for bleeding hogs than a skinning knife. A 6-inch skinning knife costing from 30 to 50 cents should be purchased for skinning cattle and veal calves and for dressing sheep. A steak knife, while not necessary, can always be used to advantage in cutting up carcasses for home use; a 12-inch or 14-inch knife can be purchased for about \$1.25. All knives should be made of good steel, so that they can be well sharpened and will retain good cutting edges. A good steel, costing about \$1.25, is very necessary; it is usually rough when new and should be ground or rubbed smooth on a grindstone or coarse brick. A 26-inch meat saw is probably the most convenient size for cutting and splitting carcasses and all other purposes. A cleaver is very handy for all kinds of work; an 8-inch one can usually be purchased for about \$1.50.

A stout rope must be provided for fastening cattle at the time of slaughter and for hoisting the carcasses afterward. The candlestick, or "bell shaped" scraper, is probably the most convenient tool to use in cleaning hogs. It can be purchased at most hardware stores for about 25 cents. Other implements such as a straight corn knife, or hoe, also may be used. Hog hooks, gambrels, scalding vessel, table or platform, rack for hanging carcasses and some alkali material to aid in scalding also are needed in slaughtering swine. Hog hooks can be purchased at the hardware store, or made by the local blacksmith. The hook part should be made longer than on those generally offered on the market, as the hog can then be handled more securely in the water. Gambrels can be purchased or made from hard wood. For a scalding vessel, use a barrel or a trough from 5 to 6 feet long, about 2 feet deep, 18 inches wide at the bottom, and 2 feet or so at the top. A low table is convenient for scraping, or a platform constructed at the end

of the trough or barrel may be used. A convenient rack for hanging the carcasses must be provided. This may be built solid; or a ladder placed against a building, or a rail suspended between two buildings, or tripods may be used.

In dressing beeves, there is needed, in addition to the butchering tools, a pritch to support the carcass while skinning the sides and removing the legs; also a beef tree with which to raise the carcass. This may be purchased for from \$4 to \$5 but this expense is not warranted unless a large amount of beef

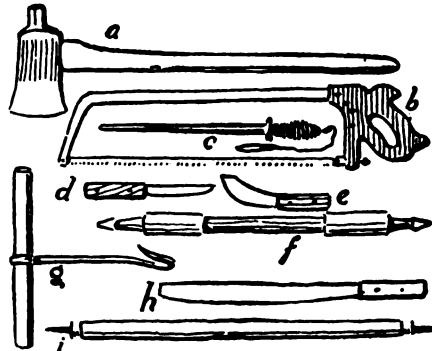


FIG. 560. A farmer's butchering outfit. *a* Killing axe; *b* Meat saw; *c* Steel; *d* and *e* Skinning knives; *f* and *i* Gambrels; *h* Steak knife; *g* Hog hook.

slaughtering is done, as a two horse evener can be used in its place. This should have two holes bored in it, about 4 inches apart, near each end through which bolts can be inserted to keep the carcass from sliding off when hung up.

A cutting bench or block (which may be an ordinary table or rough bench) must be provided for cutting up the carcasses; also a meat cutter of some kind to grind the meat used for sausage and hamburger. Standard makes in different sizes are available in any hardware store.

Handling Animals Previous to Slaughter

This is an important factor in securing a desirable quality of meat. Even a prime-well fattened animal will not produce a choice carcass if not handled according to the following rules:

1. Keep the animal off feed for 18 to 24 hours before slaughtering but allow it all the water it will drink. In this way the blood is diluted, bleeding is more thorough and the internal organs are more easily removed.

2. Keep the animal from becoming overheated or excited, which causes an abnormal condition of the body, increases its temperature, makes it difficult to cool the carcass, and causes the meat to sour or spoil.

3. Do not bruise or pound an animal. Bruise marks will show up on the carcass and detract from its appearance, and also cause the meat to spoil very rapidly.

4. Fasten animals securely to prevent their escape at the time of slaughter. Cattle can be tied with a stout rope; swine are driven by means of a hurdle or with a rope about the hind leg or the upper jaw back of the tusks; sheep can be handled by means,

of a small rope about the hind leg, or by grasping the animal under the jaw and at the dock.

5. Have all tools in good shape and every-

thing in readiness before starting the work.

6. Cool the carcass as rapidly as possible. Always split heavy carcasses at the time of slaughtering.

Slaughtering Beeves

Handling. Beeves should be securely fastened so that they can be stunned before bleeding. Tie a stout rope around the neck of the animal then loop it around the upper part of the nose. It should be long enough so that it can be fastened to a post or held by a couple of men. A ring in the lower part of the post



FIG. 561. Killing, sticking, and bleeding a beef. Note position of head and legs of carcass

or in the corner of a building, through which the rope can be drawn, will aid greatly in securing the animal.

Stunning. The object of stunning is to render the animal unconscious and make it possible to get it into a position so that it can be properly bled. Imagine lines drawn from the base of each horn across to the opposite eye; where these two lines cross in the centre of the forehead is the proper place to stun the animal. Use a heavy hammer, killing axe, or common axe; strike a heavy blow, and make certain that the animal cannot get up when the rope is loosened; remove the rope, and the animal is ready to bleed.

Bleeding. The 6-inch skinning knife is best for this. The throat may be severed just back of the jaw bone, but a more desirable method is to place one foot in front of the front legs of the animal, and the other below the head. Draw the hide tight over the neck and make a long slit from the brisket to the head, cutting deep enough to expose the windpipe. Insert the knife just in front of the brisket, cutting parallel to the front of the shoulder and deep enough to strike the vertebrae, after which cut toward the head. This will sever the arteries as they come from the heart. If the knife is inserted too far back and the diaphragm cut open, the blood will drain back into the chest cavity. This condition should be avoided.

Skinning the head. Begin skinning the head by cutting from the poll to the nostrils. Skin out the face and down on each side of the head as far as possible. Skin back over the poll. Remove the head by cutting across

the "Adam's apple" (*epiglottis*). Cut toward the neck so as to expose the large open joint; cut the muscle and cartilage on each side, and the spinal cord in the vertebrae, removing the head. Take out the tongue at once. Cut on each side of it just inside of the jaw bone, loosen the tip and draw back the whole tongue, cutting around the bone at its root. Clean by putting it into clean water and scraping it with a knife, working from the tip to the root. Then hang it up by fastening both the root and tip to a hook; or lay it on a table or platform.

Skinning the forelegs. Roll the animal on to its back and hold it in position by means of a pritch or blocks of wood. Begin skinning out the front legs by cutting across the enlargement on the lower part of the knee joint where the straight joint is located; make the cut through this joint and remove the shank. When the cut is made too high, the irregular joint is located, at which point it is difficult to remove the leg. Cut the straight joint deep enough to allow the leg to straighten. Skin the sides of the leg and remove the bone. Never skin out the portion of the forearm above the knee, or these parts will be soiled when the carcass is raised.

Skinning the hind legs. Cut the tendons between the dew claws and hocks, which will straighten the leg. Place the leg between your knees, draw it toward the front of the carcass and skin out over the back of the leg, holding the knife flat, and opening the hide to just back of the cod or udder. Skin on each side of the leg and hock, cutting between the tendons so that the beef tree can be inserted when the carcass is ready to be raised. Remove the leg joint by cutting across the enlargement of the hock on the lower portion through the straight joint.



FIG. 562. Opening hide over face of beef

Skinning the body. Open the hide by making a cut from the brisket to the tail, cutting along the midline. Begin skinning over the brisket and down over the side, working around the animal. In skinning, hold the hide tight with one hand and skin with the knife flat against the hide. Work down over the side and rump as far as possible. It is a good plan to have a cloth and bucket of hot water at hand, with which to wipe up any particles of blood or dirt that may be on the outside of the carcass. If allowed to dry, they are hard to remove.

Removing the viscera. Loosen the windpipe and gullet by cutting on both sides. Open the abdominal cavity by cutting through just back of the breast bone. Holding the knife upright, with the cutting edge toward the tail, insert the free hand in the abdominal cavity, guide the knife backward toward the round, taking care not to cut the viscera. Split the breast bone (*sternum*) through the midline with a saw. Then pull the intestines out to one side to make room in the pelvic region and split the pelvic bone in the hind quarters, cutting at the point where the white connective tissue separates the muscles of the inside of the round.

Raising the carcass. Insert the beef tree or evener in the hind legs, attach the tackle and raise the carcass high enough so that the hide can be conveniently removed from the rump and tail. Skin down over the rump as far as possible, but do not loosen the hide from the



FIG. 563. Splitting the beef carcass

outside of the leg or it will be difficult to finish skinning the sides. Loosen the rectum by cutting around it and pulling it toward the paunch and intestines. Be sure not to remove the bed fat which lies in the pelvic region. Raise the carcass higher and remove paunch and intestines by forcing down on them. Remove the liver from the abdominal cavity. Always take off the gall bladder, which lies on the side of the liver, being careful not to break it as its contents would taint the liver. Cut the diaphragm, which separates the abdominal and chest cavities, making the cut at the place where the muscle and con-

nective tissues come together. Cut the attachments along the back bone and on the lower side, and remove the pluck (heart and lungs). Now raise the carcass higher so that the neck will clear the ground.

Start to split the carcass with a saw; an attempt to do this with an axe or cleaver will result in an unsatisfactory job. The weight of the saw is all the pressure that should be applied; more will cause it to work to one side. Split down to the rise in the backbone.

Finish siding the beef by taking long strokes from the round to the shoulder and neck. Work over the side of the loin and ribs. Then loosen the hide from the outside of the leg, and if the thin membrane which covers the outside of the round has not been broken, the hide



FIG. 564. Skinning fore quarters of beef after raising it from the ground.

can be pulled down. Skin down over the back (which is easily done as the weight of the hide will force it away) and continue over the shoulder and neck. Open the hide from the side of the brisket to the forearm by cutting in a straight line from the centre of the brisket. *If the cut is made too far back, it will be considered a hole making the hide a Number 2, which sells for about a cent less per pound than a good, uncut hide.*

Finish splitting by working from the back of the carcass forward, taking care to split each vertebra and spinal process through the centre. Trim up the neck by removing all scrag ends left as the result of sticking. With a clean, hot, damp cloth thoroughly wipe all parts of the carcass thoroughly clean, then allow it to cool.

Folding the hide. Spread the hide on the ground flesh side up and allow it to cool. During warm weather sprinkle salt on the inside before folding it. Fold the portions removed from the legs and head over on the body part, then fold the body portion once from each side. Roll it from the front and tie securely with a stout cord so that it may be shipped. (See p. 518 for tanning directions.)

Cutting Beef Carcasses

Quartering. For convenience in handling, the beef carcass is usually divided into quarters, by cutting between the twelfth and thirteenth ribs (A to B, Fig. 565), leaving 1 rib on the hind quarter and making the 4 portions nearly equal in weight. In making the division, begin cutting at a point 4 inches from the outside on the flank end. Cut toward the backbone, making the cut smooth and

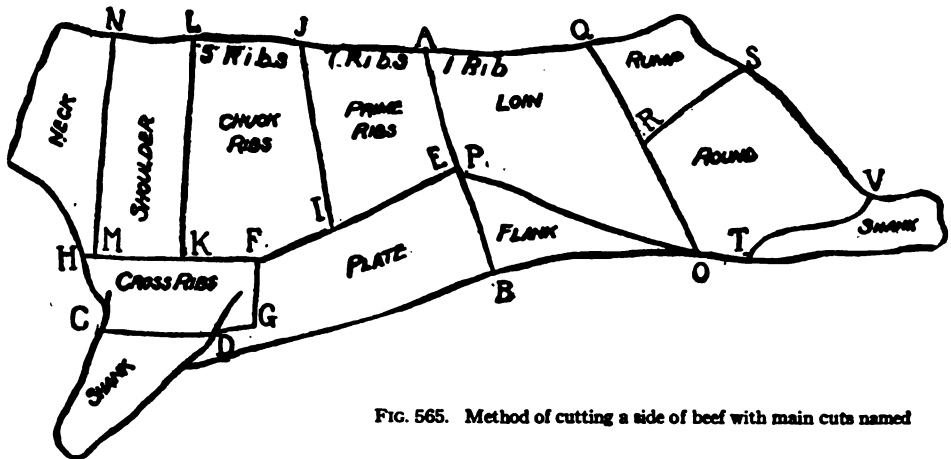


FIG. 565. Method of cutting a side of beef with main cuts named

midway between the ribs; use the saw to cut through the backbone. The attachment at the flank is strong enough to hold the weight of the front quarter, until the person carrying it can get it well balanced on his shoulder. When he has it well placed, let another person cut it loose from the hind quarter. Place the quarter on a block or bench with the outside up. In cutting beef aim to separate the thinner portions from the thicker cuts.

The Fore Quarter Cuts

Shank. The shank is first removed from the body by cutting from C to D. Divided into convenient pieces this is used for soups and boiling; the fleshy portion may be used for hamburger or sausage.

Plate. The lower portion of the ribs is known as plate, and is removed by cutting from E to F to G to D. Cut into suitable pieces it is used for stewing, boiling, hamburger, short ribs, and corned (p. 498).

Cross ribs. From the lower part of the shoulder is secured a small piece of meat which is commonly called cross ribs (H F G D C) and used for pot roasting and boiling.

Prime ribs. The first 7 ribs are classed as prime and are cut from I to J. This is the choicest portion of the front quarter, as it contains the tenderest meat and the smallest percentage of bone. It is used almost entirely for roasts. There are different ways of preparing it for the oven. A *rolled roast* is prepared by removing all the ribs and the chine bone on the back, rolling the meat portion into a compact bundle and tying it with a stout cord, or holding it in place with wooden skewers. A *folded roast* is prepared by removing the vertebrae and a piece of bone about 2 inches long from the middle of the



FIG. 566. Prime rib roast of beef

ribs and folding and

fastening the small end of the roast over on to the thicker portion. The *standing roast* is prepared by removing only the spinous process of the vertebrae and sawing across the ribs in two places.

Chuck ribs. The 5 remaining ribs, classed as chuck, are cut from L to K. This part is divided into convenient pieces to be used as oven roasts or boiled. It may also be corned.

Shoulder. The shoulder, separated from the neck at N M, contains a high percentage of bone and is one of the more inferior cuts. It may be used for boiling, pot roasting, steak, or as corned beef, after being cut into suitable pieces, cutting across grain as far as possible.

Neck. The neck contains a large amount of connective tissue and is the toughest piece of meat secured from the beef carcasses. It is used mainly for cutting into hamburger or mince meat.

The Hind Quarter Cuts

Kidney fat. Place the hind quarter on the bench or block inside up and pull or cut from the carcass the kidney fat leaving a layer about 1 inch thick. The fat is used in the preparation of various articles of food, or may be tried out for tallow.

Flank. Remove the flank by cutting just in front of the stifle joint and through the lower or thin portion of the loin (O to P). About 4 inches of the lower part of the rib is usually left in the flank. It contains about half fat and cartilage, and the edible portion is tough.

The heavy flat bundle of muscle may be used for stewing or hamburger.

Loin. The most valuable part of the hind quarter is the loin, separated from the round by the cut Q to O. It is used entirely for steaks and roasts. In cutting steak, start

Round. After the rump has been removed, the round is ready to be cut for steaks, beginning at the top; the choicest cuts come from the centre. The round also makes very desirable roasts, when cut to the right size. The lower part contains a large amount of con-



FIG. 567. At left a wedge bone sirloin cut; centre, loin showing porterhouse steak; right, the round cut

from the large end of the loin, from which end the *sirloin* cut is secured. The *porterhouse* steak comes from the lower part of the loin and can always be identified by the "T" bone separating the two bundles of muscle.

Rump. The rump is taken from the top of the round by cutting parallel to and just below the pelvic bone from R to S. It is cut into suitable pieces and used for roasts, boiling, and corned beef.

nective tissue, and is tough when used for steak, but makes desirable pieces for boiling. Dried beef is frequently made from the round. When this is done, it is divided into 3 pieces, following the division of the muscles which are inside, outside and at the front knuckle of the round.

Shank. The remaining shank after being cut into convenient pieces, is used for soups, though fleshy portions may be trimmed off and used for hamburger.

Dressing Lamb or Mutton

In dressing sheep it is essential to have a dry, clean place on which to work, such as the floor of a building or a clean grass plot. A platform a few inches above the ground provides a convenient place for bleeding the animal, the head being held over the edge of the platform so that the blood drains away and does not come in contact with the fleece. It is not necessary to stun sheep before bleeding, as they are easily handled. Be careful, however, not to grasp the sheep by the fleece anywhere on the body, as this produces a bruise on the outside of the carcass. Hold the animal by grasping it under the jaw and at the tail, or by one of the legs.

Bleeding. When ready to stick the sheep, place it on its side where it cannot get a foothold on anything, and, standing back of it, put one knee on its shoulder. Grasp the jaw with the left hand; draw the head back and insert the knife (usually a sticking knife, but any sort of butcher knife will do) just back of the jawbone, close to the backbone, and force it through to the opposite side, cutting out through the fleshy portion of the neck including the windpipe and gullet. In this manner the blood vessels along the neck are cut, permitting thorough bleeding. Now grasp the top of the head with one hand, and with the other give a quick jerk, dislocating the neck at the atlas joint. This exposes the spinal cord, which should be cut with the knife or severed with the fingers. As soon as life is extinct, cut away the skin below the tongue and remove it by cutting on each side just inside of the jawbone.

Opening the fleece. Place the animal on its back and open the fleece over the knee of the front leg. Put the foot between your knees and remove a strip of pelt half an inch wide

over the knee, and down to the toes. Split the pelt along the forearm to just in front of the brisket, then along the neck, keeping the blade of the knife flat so as not to cut into the flesh of the leg. Be careful not to make the cut across the brisket, or it will be difficult to remove the skin there. Repeat the opera-

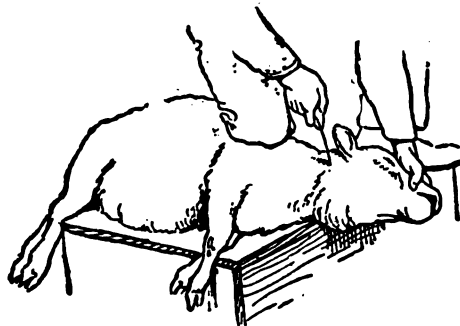


FIG. 568. Position for sticking a sheep, after which its neck should immediately be dislocated



FIG. 569. Lamb carcass as ordinarily marketed

knees and removing a half inch strip of pelt over the back of the leg, cutting toward the tail. Skin out on each side of the hocks. Loosen the tendons on the back of the leg between the hock and dew claws and remove the toes at the last joint. Repeat the operation on the opposite side and "fist" away the pelt over the inside of the thigh and over the cod to meet the fisted portion made from in front. Tie the tendons of the two legs together with a stout cord, and the sheep is ready to be hung up. Remove the toes from the front feet by cutting about an inch above the dew claws and breaking them back. In lambs the toes are easily removed at the "straight" or "break" joint, about an inch above the dew claws while in the mature sheep they can be removed only at the round joint. The presence of the straight joint is therefore an indication of a lamb carcass.

Split the pelt from the hind legs to the brisket through the midline. Continue "fisting" over the side of the body, down over the shoulder and up over the hind leg. Do this on both sides of the body, being careful not to break the thin membrane that covers the carcass. Around the dock, or tail, it may be necessary to use the knife, as it is usually difficult to loosen the pelt. Work the pelt down over the back and toward the neck, cut the head off at the atlas joint and fold the pelt so as to keep it clean on the inside. Insert the knife into the brisket and cut along the wind pipe and gullet to drain blood from the chest cavity. With a cloth wrung out of

tion on the opposite leg, and meet the cut made along the neck in front of the brisket, so as to leave a V-shaped piece of pelt which can easily be pulled from the brisket.

Use the knife as little as possible in removing the pelt from a sheep. Be sure that the hands are clean, then close the right hand and start to "fist" away the pelt on the underline, working down over the side and back to the rear flank and holding it tightly meanwhile with the left hand. Be careful not to break the layer of muscle which covers the carcass. Replace the pelt over the "fisted" portion, and open the pelt on the hind quarters by placing a hind foot between your

hot water, wipe the outside of the carcass to remove any dirt or blood.

Removing the viscera. Cut around the rectum so that it can be drawn through the pelvic region. Open the abdominal cavity by cutting just in front of the pelvic bones. Place the knife between the first two fingers and, using these as a guide to avoid cutting the intestines, open through the midline, cutting to the breast bone. In the case of lambs, remove the omentum or caul fat which surrounds the paunch and place it in the pelt to keep it warm. Remove all the organs from the abdominal cavity except the kidneys, being sure to include the bladder, which lies in the pelvic region. Cut the diaphragm; loosen the pluck and pull up through the opening made for removing the paunch and intestines. Thoroughly wipe all parts of the carcass. In lambs, the caul fat which has been removed is folded around the legs and fastened with skewers to add to the appearance of the carcass, and also to supply more fat in roasting the leg. To make the carcass compact and attractive, fold the shanks back against the forearms on the front quarter and fasten with skewers. Then hang it away to cool.

Hothouse lambs. Hothouse lambs are dressed in the same manner as described, except that the pelt is left on to keep the carcass clean in shipping and from drying out too much. The head is cut off, the opening through the midline is made in the same manner as in mature sheep, and the toes are removed. In some cases the pelt is loosened from the sides and shoulders and left attached on the hind legs, rump, and top of the withers. The caul fat is taken out and spread over the kidneys after the "back sets" have been put in; these are two sharp sticks put through the flesh in the flank just in front of the stifle joint and back of the last rib on the opposite side at the point of the plate. They are crossed on the back so as to force the loin forward.

Cutting Lamb and Mutton

The lamb or mutton carcass may be split in halves for convenience by cutting through the centre of the backbone. As in other carcasses, the thinner or cheaper cuts are separated from the thicker or more expensive ones.

Flank and plate. These are first removed by cutting forward from a point just in front of the stifle joint on the hind leg, touching the tip of the last rib, and through the shoulder, to a depression formed by the front leg (along the line A B, Fig. 570). The thin membrane which lies on the inside of the flank is removed by cutting a small strip from the lower portion and drawing the membrane from the end nearest the ribs. The front leg, which is removed with the plate and flank, is cut into convenient pieces for boiling or stewing.

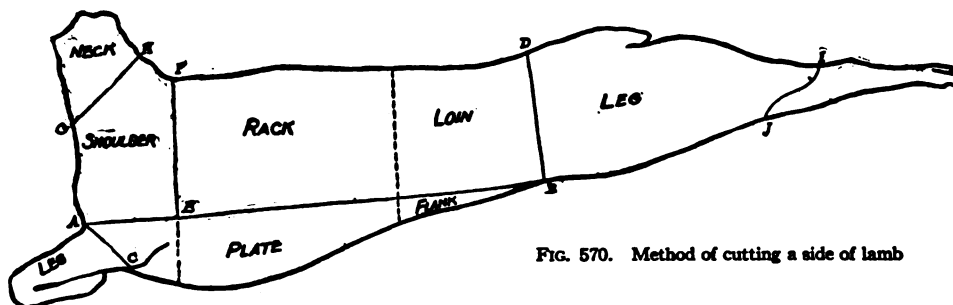


FIG. 570. Method of cutting a side of lamb

Kidney fat. The kidney fat is pulled from the inside of the loin. It may be dried out for mutton tallow or disposed of as rough tallow.

Leg. The location of the cut in severing the leg of lamb or mutton will vary, depending upon the size of roast desired. It may be cut short or well into the loin, but is usually removed along the line B D beginning at a point 2 inches back of the rise in the backbone. The leg should be neatly trimmed by removing the shank and all scrag ends, and may be



FIG. 571. A leg of lamb untrimmed, the dotted line showing where to cut in preparing the leg for cooking.

unjointed at a point just inside the fleshy portion, or it may be cut off just where the flesh forms on the bone. This is a popular piece for roasting, although it may be cut for steaks or chops.

Rack and loin. The shoulder and neck are cut from the rack and loin between the third and fourth rib, counting from in front at the line E F. There is no trimming to be done on this portion, except the removal of the thin membrane or vellum on the outside which can easily be pulled off by hand. The rack and loin may be roasted but are hardly thick

enough to be choice. If so used the backbone should be cut with a cleaver, so that the roast can be carved. The loin is usually cut into chops varying in thickness according to the taste of the consumer. From medium sized carcasses, a rib is allowed for each chop, while in heavy carcasses a chop may be cut from between each 2 ribs.

Shoulder. The shoulder contains a considerable amount of bone, and forms one of the poorer mutton cuts, but it is used for chops, roasts or boiling. Chops are cut in convenient pieces either from the lower part of the shoulder or the rib end. When to be roasted the vertebrae should be cut so that the roast can be easily carved.

Neck. The neck is neatly trimmed, and used for stews and boiling.

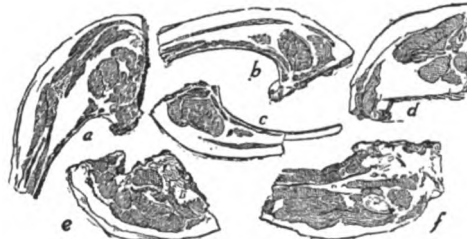


FIG. 572. Types of lamb chops: a Shoulder chop; b Plain rib chop; c French chop; d Chop from centre of loin; e Chop from larger end of loin; f Chop from lower end of shoulder.

Slaughtering Swine

Sticking and bleeding. It requires two men to stick a hog, which should be placed squarely on its back, where one person holds it by the front legs, with his feet placed firmly back of each shoulder; when the legs are drawn back the hog is helpless. The person doing the bleeding should grasp the hog by the jaw, hold it firmly, locate the breast bone, and make a long slit through the skin from it toward the jaw. He then inserts the knife just under the breast bone, and in toward the chest cavity in the midline, from 4 to 6 inches, depending on the size of the hog, and then cuts toward the backbone. By cutting downward he severs the arteries coming from the chest

cavity and provides for thorough bleeding. The cut must not be made on either side of the midline, as this will result in a "shoulder stuck" hog, in which the knife cuts back of the ribs, and the shoulder fills with blood. Such a shoulder cannot be cured. Care must be exercised not to get the knife too deep so as to cut the membrane which protects the opening into the chest cavity, or the blood will turn back into the cavity, and form heavy clots there (Immediately after sticking, let the hog rise or hoist it by the hind legs so that thorough bleeding will result.—Editor).

Scalding. Once dead, the hog is ready to be scalded either in a barrel, trough, or special



FIG. 573. How to hold and stick a hog

scalding tank. The proper temperature of the water for scalding hogs is from 145 to 155 degrees. On a farm it is usually difficult to maintain this temperature, unless a steady supply of hot water is at hand. If the weather is cold it is best to bring the water to the boiling point, then add enough cold water to reduce the temperature to 165 or 170 degrees. In scalding hogs in water of this temperature, scald the hind end first, for if the hairs should set, it is easier to shave the hind quarters than the front. It is quite essential to add some kind of alkali to the scalding water; 2 teaspoonfuls of concentrated lye, a handful of soft soap, a small shovelful of hard wood ashes, or a small amount of coal tar will aid materially in removing the scurf. Keep the hog in motion while in the water. When a hog hook (which makes handling the hog easier) is used, insert it through the lower jaw. After the body has been in the water a short time, draw it out on a table and allow it to "air." Then put it back in the water and leave it there until the hair and scurf can be removed easily with a scraper. To scald the front end after the hind end has been scalded, open the tendons at the back of the hind legs, being



FIG. 574. Opening a hog carcass along the midline

careful to loosen both tendons, and insert the gambrel (if only the top one is loosened, it may not be strong enough to hold the weight of the carcass). As soon as most of the hair and scurf have been removed from all parts of the carcass, loosen the tongue by cutting on each side of it inside of the jawbone. If loosened at this time, it is more easily removed later on with the pluck.

Having provided

a rack or other support, hang the carcass up, pour hot water over the outside and shave off all remaining hair or scurf. After thoroughly washing and carefully scraping the outside, rinse again with cold water and scrape once more, working from the top so as to remove all the dirt.

Removing the viscera. Make a cut through the hide, from the pelvic region down to the point in the neck where the knife was inserted in sticking. Cut through between the hams, from the pelvic bone, and loosen the rectum by cutting around it from the outside and pulling it through the opening made between the hams. In opening the abdominal cavity, place the point of the knife between the first 2 fingers of the left hand, insert into the opening, and cut down to the breast bone, the fingers guiding the knife and preventing it from cutting the paunch or intestines. Pull the paunch, intestines and liver out of the abdominal cavity. Split the breast bone by cutting from below. Cut the diaphragm (which separates the heart and lungs from the paunch and intestines) by severing the membrane along the very noticeable line where the connective and muscle tissues join. Cut close to the backbone and toward the chest cavity, and the pluck is easily removed.



FIG. 575. An easy way to scald a hog

In mild weather it is a good plan to remove the kidney fat or leaf lard at once by starting at the lower end and pulling up on it. Taking it out at this time will help to cool the carcass thoroughly and quickly. During mild weather it is also a desirable practice to split heavy hogs through the middle of the spinal column so as to expose more surface. Then thoroughly wash the inside with cold water, taking care not to get water on the outside.

Cutting Pork Carcasses

There are many methods of cutting pork carcasses, some of them based simply on local customs that have been followed for a long time, and have become the standards in their communities. The following method is that generally followed by the retail trade, and regarded as most acceptable for farm use.

Splitting. Pork carcasses are split either just after slaughtering or when being prepared for the curing vessel and for fresh pork. They should be divided through the centre of the backbone, and not on each side of it as is so frequently done for the local trade, with a resulting mutilation of the bundles of muscle

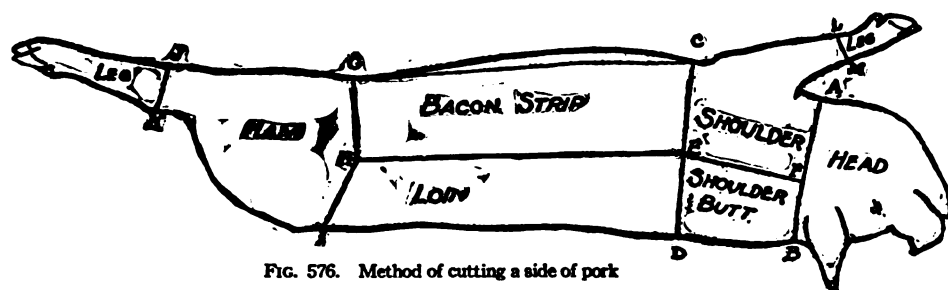


FIG. 576. Method of cutting a side of pork

fibre, or loin, on each side. The carcass is divided into 4 main parts—head, shoulder, middle and ham.

Head. The head is easily removed by cutting about an inch back of the ear, and across the "Atlas joint," neither saw nor hatchet being needed. The meat may be used for sausage, salt pork, head cheese, or in baked beans.

Shoulder. The place to separate the shoulder from the middle depends upon the amount of cured or fresh meat desired; if a large amount, only 1 or 2 ribs are left on the shoulder. The portion of the shoulder to be cured should be neatly trimmed. Remove the ribs and vertebrae, cutting as close to the bone as possible. These ribs are known as neck spare ribs. Before roasting, crack the bones with a cleaver or hatchet. If the entire shoulder is to be used as cured meat, trim it neatly, removing all scrag ends and cut the shank at the knee joint. If only a small amount of cured meat is desired, the upper third of the shoulder may be cut off and used

which will aid in trimming the ham and also cut a higher percentage of loin. After being removed the ham should be neatly trimmed, all scrag ends and surplus fat cut away; leave only enough to cover all parts of the lean on the outside. Remove the shank at the hock joint. The ham is usually cured, but may be used fresh for steaks or roasts.

Middle. Unless the leaf lard has been removed before cooling the carcass, it is pulled from the middle before any other cut is made by starting near the rib end and removing it in 1 piece. Before frying it out, cut it into pieces about an inch square.

The loin and fat back, making the fleshy portion of the middle, are removed in 1 piece. Make the cut just below the heavy bundle of muscle fibre on each end, cutting parallel to the backbone so that the edge of the bacon strip is straight and the loin edge cut at an angle. Remove the fat from the loin and use it for salt pork or lard. The loin proper is the choicest fresh cut from the whole carcass, and is used for roasts and chops. Chops should not be more than half an inch thick, as pork must be well cooked. When to be roasted, cut into suitable pieces and clip the vertebrae so that the meat can be carved. The loin is not a desirable piece to cure because it carries a large amount of lean meat.

The bacon strip must be trimmed and the ribs removed, by cutting close to them so that practically all the meat remains on the bacon strip, where it is more valuable than on the spare ribs. These are the choicest ribs secured from the entire carcass, and should be cracked with a cleaver before being roasted. Flatten the bacon strip with a cleaver or other flat implement and trim off all scrag ends. This is generally cured, but may be used fresh if desired. The choicest part of the bacon strip comes from the front end, or where the ribs have been removed.



FIG. 577. Bacon strip, shoulder and ham properly trimmed

as a roast or chops. The lean portion is known as the "Boston butt." The fat on the back of this piece and all odd fatty bits are used for lard, and all scrag ends of meat for sausage.

Hams. The amount of cured ham desired governs the place to cut the ham from the middle. In the "American" style it is cut short; in "English" style it is cut long. In either case it should be cut from the middle at an angle of about 45 degrees (see Fig. 576)

Dressing Veal

Nearly every state or city government has its own regulations with reference to the age or weight at which veal may be offered for sale; these can usually be secured through commission merchants or state officials. In many states the age limit is 3 weeks, in others the dressed carcasses with hide on must weigh more than 56 pounds.

Veal calves may be "hog dressed," that is, with head, legs and internal organs removed and the hide left on; or they may be skinned, the method depending upon the requirements of the market to which they are shipped. When possible, the hide should be left on for shipping, as the carcass keeps cleaner and there is less shrinkage.

Bleeding. Calves are rendered unconscious before bleeding, usually by a blow with a small hammer or hatchet. They may be bled while in a lying position, or they may be suspended by the hind legs and stuck just in front of the chest cavity.

Skinning the head and legs. Whether the carcass is skinned or "hog dressed" the head must be removed. Begin by making a long cut on one side of the head, skin out the face and down over the side of the head, well back on the neck, then raise the head, and skin out the other side. Remove the head by cutting across the epiglottis (Adam's apple) and locating the "Atlas joint" at the base of the head, at which point the head is easily removed. Remove the tongue and scrape it clean in cold water. Then remove the brains, which, when cooked, are considered a delicate dish.

The legs also must be skinned out in either style of dressing. The front legs are skinned below the knees and the shanks removed at the straight joint, located at the knee enlargement. In the "hog dressed" carcass this completes the skinning; if the carcass is to be completely skinned, the rest of the forearm is not skinned until after the carcass is hung up and the internal organs are removed.

In hog dressing the hind shanks below the hocks are skinned, but the hide is left on the hock and the balance of the leg. When the whole body is skinned, the hocks also are skinned out and the hide opened over the inside of the thigh. Then the lower part of



FIG. 578. Removing viscera from hog carcass

the leg is removed by cutting across the lower part of the hock and locating the "straight" joint, at which the leg is easily removed.

Skinning the carcass. The veal is skinned after it has been hung up on a rack. Begin by skinning the inside of the round and down over the underline and side. After skinning the thigh, flank, underline and around the rectum, it is possible

to pull the hide from the round and back, but be careful not to tear the muscle tissue which covers the outside of the carcass. Skin down over the shoulder, neck and forelegs, removing the hide from the entire body. With a clean, hot, damp cloth wipe the outside of the carcass clean.

Removing the viscera. First cut around the rectum, making certain that it hangs loose in the pelvic region; next open the abdominal cavity by cutting through at the cod; then guiding the knife between the first 2 fingers, cut down to the breast bone. Leave the liver in the carcass. Cut the diaphragm and remove the pluck. The breast bone may be split, but this is not necessary. Thoroughly wipe the outside and inside of the carcass and trim the neck clean of all scrag ends.

Shipping. To reach the market in good condition, the "hog dressed" veal should have the skin, from which the legs and head are removed, securely tied to the body so that neither will become dirty. Tie or sew up the midline so that dirt will not get inside. A skinned veal carcass should be wrapped in cheese cloth, paper and burlap, the last being fastened with skewers, or sewed. Shipping tags obtainable from express companies should be securely fastened on the carcasses and should carry the name and address of both the buyer to whom they are consigned, and the shipper.

Cutting a Veal Carcass

The veal carcass may or may not be split before being divided into retail cuts, but it is probably more convenient to split it through the centre of the backbone and divide the sides into front and hind quarters (corresponding to wholesale cuts of beef), by cutting between the twelfth and thirteenth ribs, leaving 1 rib on the hind quarter (more ribs may be left if desired). The wholesale cuts of veal are similar to those of beef, although the method of cutting is not exactly the same. The hind quarter is usually cut into leg and loin, the rump being removed from the leg and sold, or used as a roast. The rest of the leg is used either for convenient sized roasts or steaks about half an inch thick; the shank is cut into suitable pieces for soups. The loin may be used for roasts or, better, in the case of small carcasses, for chops. For roasting the kidneys and flank are left on the loin, making a "kidney roast."

Front quarter. Many methods of cutting the front quarter are followed, but on the farm

it is customary to separate the thicker portion of the carcass from the lower part of the shoulder which is used for boiling and stews when cut into pieces about 2 inches square. The thicker portions, such as the ribs and

shoulder, may be used for roasting in which case the backbone or vertebrae should be clipped to make carving easier, or for chops cut from one half to three quarters of an inch thick.

Coöperative Beef Rings

In some sections groups of farmers secure a fresh supply of meat during the summer months through what are known as beef clubs, or community slaughtering organizations. These are especially successful in communities located a considerable distance from fresh meat centres. They are organized along a number of different lines, but in every case it is necessary first to have a true coöperative spirit and the united support of all the members. A club may be organized in connection with some other coöperative association, such as a creamery, elevator, store or live stock association, or independent of such a body.

The number of members needed depends upon the number and size of their families; but there should be enough so that at least 1 beef carcass can be handled each week. The usual number of families is from 20 to 25. In order that no time will have to be given to minor details during the busy season, permanent plans should be perfected during the winter months. That is, the slaughterer should be secured, the supply of cattle listed, and the scale of prices at which the cattle are to be estimated and the meat disposed of, should be arranged.

Building and equipment. Some of the well established beef rings have built small buildings equipped with cooling rooms, in which to do all the work, but this is not really necessary, as it can be done on any farm, where a shed or other building and a set of common butchering tools are available.

How cattle are obtained. In some cases they are provided by members of the club; in others they are purchased by a committee or the person doing the slaughtering. The most satisfactory way of handling animals if supplied by members is to purchase them at the market price and credit each member with the amount of meat received. This is simpler and more satisfactory than having each member supply an animal each season, on account of the difference in weight of animals so supplied.

Slaughtering. The slaughtering is usually done in the evening, and the carcass allowed

to hang and cool over night. The next morning it is cut into retail pieces and each member is supplied with his share of the steaks, roasts, boiling and stewing pieces. The amount supplied each patron may vary slightly from week to week, on account of difference in the weights of the carcasses, but the animals should be of as nearly the same weight as possible. The meat is usually wrapped for each patron so that it can be called for at a stated time; or it may be delivered to all the patrons at a nominal fixed charge for each delivery. In other cases when the beef ring is connected with some other association, the slaughtering is done at a time when a trip must be made for other purposes; or the meat may be distributed by a few patrons, each taking charge of the parcels for all those on his route, and each taking his turn at making such delivery.

Financial arrangements. No cash outlay is required when the animals are supplied by the patrons of the club, as the sales of by-products will take care of the current expenses. In case the animals must be purchased, it is necessary to raise money to pay for them as fast as they are purchased and slaughtered. This may be done by making an assessment when the work is started, if the slaughtering is done only during the summer. Another plan is to have each patron pay each week or month for the meat supplied him according to fixed charges for the different cuts decided upon at the annual meeting which is usually held during the winter or spring. If the animals are supplied by members, they should be taken at a fixed price per hundredweight and a certain standard of condition and weight required. The reason for making a charge for meat supplied, is that each patron gets different cuts and may get a different amount each week. At the close of the year all accounts are settled, as practically no meat is handled during the winter.

The slaughterer is usually paid a given sum for each animal and carcass handled, which may vary from \$2.00 to \$4.00 per head. In addition to slaughtering he is expected to keep an account of the amount of meat supplied each patron and the charges made.



FIG. 579. Shank of beef ready to be used as soupbone.

CHAPTER 46

Cured Meats and By-Products

By PROFESSOR W. H. TOMHAVE (See Chapter 45). *What canned vegetables and preserves are to the housewife, cured meats and meat by-products are to the farmer who raises a few bees, sheep, and hogs for home consumption. The success and economy of both depend upon the skill with which they are prepared.*—EDITOR.

THE objects of curing meat are: (1) to avoid the necessity of using all meat produced at once, while fresh, and (2) to preserve it in palatable, and even improved, condition for future use. It also makes possible the shipping of meat to practically all parts of the world without the use of refrigeration. Meat products of various kinds have been cured for centuries and to-day their preparation is one of the most important phases of the meat industry, both on a commercial scale and on the farm where it affords a means of supplying the home with meat in sufficient amount and at reasonable cost. There are 2 methods of curing meat: *brine curing* and *dry curing*. Both give good results and a choice should depend on the personal preference of the individual.

Kinds of meat cured. A large percentage of all the meat cured on the farm and in the packing house is made up of pork products. Pork lends itself more readily to curing than other meats because it has a large amount of fat that does not harden materially in passing through the curing process. Beef is used to some extent, especially the poorer carcasses; it is also used largely for canning purposes, a practice better suited to packing house than to farm conditions. Lamb, mutton, and veal are seldom if ever cured because the flesh and fat become hard, dry, and unpalatable when put through the curing process.

Ingredients used. Of the many materials used in curing meat only a few that are commonly and most conveniently used in the home or on the farm need be discussed here. *Salt* is the most common. It has an astringent (contracting) effect, tends to harden the muscle fibres, and is strongly preservative; meat can be cured with it alone. *Sugar* or *molasses* is commonly used for two reasons: (1) it adds a sweet and desirable flavor to the meat; and (2) it counteracts the hardening effect of salt. *Salt peter*, used in limited amounts, has a preservative effect, but is used mainly to help retain the natural color of the meat which the action of the salt weakens or destroys. *Baking soda* is sometimes used to sweeten the brine or keep it from souring.



FIG. 580. Removing tongue from head of beef

What the law allows. Certain materials that were once commonly used in curing meats are now known to be injurious to the human system or otherwise undesirable. Nevertheless some people will con-

tinue to use them because they are effective. If such meat is merely for home use, this is their own affair; but if they intend to sell such products, they must conform to the Pure Food and Drug Law and the regulations of the Bureau of Animal Industry of the Department of Agriculture which has control over interstate shipments. The latter regulations as to curing meats are, in effect, as follows:

No meat or meat product shall contain any substance which impairs its wholesomeness. There may be added to meat and products common salt, sugar, wood smoke, vinegar made from cider, wine, malt, sugar, glucose, or spirit, pure spices, saltpeter, and nitrate of soda. Benzoate of soda may be added only when such use is declared on the label.

Only harmless coloring matters may be used, and these only with the approval of, and in such manner as may be designated by, the Department of Agriculture. Dyes may be used only in the manner and under the conditions following: (a) They may be mixed with prepared fats, such as lard and lard compounds. (b) They may be used for coloring sausage or other casings, by dipping or application, provided the character of the casing is such that the dye does not penetrate

into the meat food product contained. If cloth casings are used, they shall be coated with uncolored paraffin before the dye is applied. (c) When artificial coloring is used, the product shall be marked or labeled to that effect.

Sausage shall not contain cereal (including bread) in excess of 2 per cent by weight.

Water or ice shall not be added to sausage except to make the grinding, chopping and mixing easier, in which case it shall not exceed 3 per cent except that sausages of the smoked or cooked class such as Frankfort, Vienna and Bologna style, may contain added water in excess of 3 per cent, but not in excess of an amount necessary to make the product palatable. No "compound," lard substitute, lard or lard compound shall contain added water.

Equipment. Vessels must be provided to hold the meat if brine curing is practised, their size depending upon the amount of meat to be cured. Earthen crocks or jars may be used, but they are usually expensive and there is also danger of breakage in handling them. Light, hardwood barrels are best suited for home use. These can be purchased new, or liquor, kerosene, or vinegar barrels may be used, *after* being burned out on the inside. Molasses barrels may be used after being scalded.

Curing and Smoking

Sugar cured pork. The meat should always be thoroughly cooled before being put into the curing vessel; all cuts must be neatly trimmed and all scrag ends removed. Rub the hams, bacon, and shoulders thoroughly with salt, and let them remain on a bench or table over night. The next day pack them into a vessel, with the hams on the bottom and the bacon pieces on top. For each 100 pounds of meat, weigh out from 8 to 10 pounds of common barrel salt, 3 pounds of brown sugar, and 2 ounces of saltpeter. Mix thoroughly and dissolve in 4 gallons of boiling water. Allow the solution to cool, then pour it over the meat. *Never pour hot brine over meat.* Cover meat in barrel with brine even if more water has to be added. Weight the meat down with a clean, round board cover and stones. Do not use iron as the salt will have a tendency to rust it. Put the vessel in some cool place. If the brine begins to show signs of fermenting or spoiling, remove it, boil it, and pour it back over the meat. The bacon strips may be taken out of the brine for smoking at the end of 5 weeks or left in for 6 or 7 weeks without injury; the hams and shoulders must be left in for the latter period.

Dry cured pork. This involves more labor than brine cured, since the dry mixture must be applied at different intervals. It requires the same ingredients but in different proportions. Weigh out from 5 to 6 pounds of common barrel salt, 2½ pounds of brown or granulated sugar, and 2 ounces of saltpeter and mix thoroughly. Divide this mixture into 3 equal parts. Rub the meat with one part and pack it in a vessel, a meat trough, or on a bench. At the end of 3 or 4 days rub it again with a second portion of the mixture, and put it back in its place. At the end of another 3 or 4 days rub it with the remainder of the mixture and again repack it in the vessel or trough allowing it to remain for from 2 to 3 weeks. Although it may be cured in a shorter time, it is well to allow a little longer.

Plain salt pork. Rub each piece of meat thoroughly with fine barrel salt then pack it in a barrel or other vessel. For each 100 pounds of meat, weigh out 10

pounds of salt and 2 ounces of saltpeter. Dissolve these in 4 gallons of boiling water, and pour the solution *when cool* over the meat. The pork will be ready for use at the end of 3 weeks, but should be left in the brine until used. A dry salting process may also be used as follows: Pack the meat in a suitable vessel the same as when brine cured, and pack around it a mixture of 10 pounds of salt and 2 ounces of saltpeter to each 100 pounds; leave it in this dry salt until it is to be used.

Corned beef. This is made from the thinner or cheaper cuts, commonly the plate, flank, shoulder and lower part of the round. Cut the meat into convenient sized pieces. For each 100 pounds weigh out 10 pounds of salt, 4 pounds of brown or granulated sugar, 4 ounces of saltpeter and 2 ounces of baking soda, but do not mix. Sprinkle a layer of the salt on the bottom of the barrel, and pack in a layer of meat; sprinkle a layer of salt over the meat and add another layer of meat and so on until the meat and salt are used up. Then dissolve the saltpeter, sugar and baking soda in a gallon of boiling water, allow the solution to cool thoroughly and pour it over the meat. Add enough water to cover and weight the meat down with a clean board and stone. It will be ready for use at the end of 2 weeks, but should be left in the solution until used.

Dried beef. Two parts of the beef carcass are commonly used for drying, namely the round and the "shoulder clod" or the muscle that lies over the shoulder blade. If the round is used, it is divided into 3 pieces, namely, the inside, the outside and the knuckle which lies in front of the thigh bone. For each 100 pounds of meat, weigh out 5 pounds of salt, 3 pounds of granulated sugar, and 2 ounces of saltpeter. Rub the meat with one third of the mixture and pack it in a jar or other vessel. After 3 days, rub it with another third of the mixture, repack it, and after another 3 days, rub it with the remainder of the mixture and allow it to stand for from 4 to 7 days. Then smoke and dry it, after which it is ready for use.

Smoking Meats

Cured meats and some sausages are smoked both to aid in preserving them, and to add to their flavor. For smoking, a fireproof building is best but other simple structures may be used. The house should be high and narrow, and provided with ventilation. The best fuel for smoking meat is hard maple, hickory, or any other hardwood. Soft woods should not be used, as they give off and deposit on the meat during the smoking process a large amount of carbon in the form of soot. Corn cobs may be used when hardwood can not be obtained.



FIG. 581. A good farm smokehouse

When the cured meat is taken out of the curing vessel, soak it in lukewarm water for from 18 to 24 hours to prevent the formation of the coating of salt that is usually found on meat after it has passed through the smoking process. Hang it in the smoke house with no 2 pieces touching, start the fire and keep up a moderate smoke for from 36 to 48 hours. Do not get the fire too hot. The color of the meat when smoked should be amber, brown, or straw colored.

The best place to keep smoke-cured meat depends to a large extent upon the conveniences at hand. It may be covered with borax or pepper and hung in a cool, dry room. Such practice will keep away the skippers that usually attack smoked meats, but some loss results from this method of storing. It may be buried in a dry grain or bran bin. It is frequently tied up in fly and insect-proof bags. It may also be wrapped in paper and cheese cloth and the surface covered

with a wash containing considerable shellac. This will keep the meat from either molding or drying out.

Sausages and Sausage Making

The making of sausage is an old custom which originated in Europe, but which has been developed to a high plane with the progress of our meat packing industry. The following recipes are for a few of the many kinds of sausages manufactured in the packing houses of this country, that seem best suited to the needs and limitations of farm conditions.

The object in making sausages is to utilize the trimmings and otherwise wasted portions that cannot be cured or used fresh as chops or roasts. However, sausage making need not be confined to the use of these waste portions or scraps; any part of the carcass may be used, the choice portions making, naturally, the best quality sausage. In the packing houses, the poorer grades of animals are purchased and used for making sausage, but the meat is clean, wholesome, and palatable, and the product provides a splendid article of food. Sausage is stuffed into casings (the cleaned intestines of animals) of different sizes, which are tied and cut apart in different lengths, usually from 12 to 18 inches. Sausages are always sold by weight so the length may vary.

Pork sausage. This sausage is probably more widely made in the farm home than any other kind. There are various methods but that given below is easy and simple. It uses the lean trimmings of the pork and such cuts as the shoulder, loin, or ham added, if desired, in considerable amount. Pork alone may be used, but frequently from 15 to 20 per cent of beef is added. Cut the meat into small pieces, about 4 inches long that can be put through a sausage grinder. Grind it through the coarse plate, spread it on a table or bench, and add the seasoning of which the amount and kind will depend upon the individual taste; salt and pepper are the commonest ingredients. For each 100 pounds of meat, add 2 pounds of salt and 6 ounces of pepper; 5 to 10 ounces of sage may be added if that flavor is desired. If the sausage is dry, a small amount of water may be added. Spread the seasoning over the meat then put the sausage through the fine plate of the grinder. The sausage may then be made into paddies, put in casings, or stored in bulk. If made into paddies, it is fried, put into stone jars and stored in a cool place. If it can be frozen, it may be stored in bulk or as paddies without frying.

Bologna sausage. Although this kind of sausage, which takes its name from an Italian village where it was first made, may be made on the farm, its manufacture is confined largely to manufacturing plants and local butchers. It is made largely from beef, especially from such carcasses as are too thin to cut for the trade, and from old bulls and cows. It provides a means of using meat that is nutritious but which in other forms would be unpalatable.

A mixture of 8 to 10 parts of beef to 1 of fat pork is commonly used. Put the meat through a grinder, spread it on a table and season it. The amount of seasoning varies, but a common allowance is 1 pound of salt, 6 ounces of pepper and 2 ounces of coriander for every 50 pounds of meat. Add a small amount of water if the mixture is dry. Put the meat through the grinder a second time,



FIG. 582. The intestines of animals are the source of sausage casings

after which it may be worked by hand to thoroughly mix the fat and lean. Then stuff it into beef casings and smoke it for 3 or 4 hours with a light hard wood smoke. Next cook sausages in water at about 175 degrees F. for 20 to 30 minutes, after which they are ready to be used or stored.

Hamburg steak. This is a common type of sausage made from such parts of the beef carcass as are too tough for boiling or stewing. Cut the meat into small strips and put it through the grinder. It may be seasoned, but is usually prepared without seasoning. If to be seasoned, add 1 pound of salt and 4 ounces of pepper to 50 pounds of meat; onions may also be added if desired. In some cases a small amount of smoked bacon is used to give it an additional flavor. It is always used as bulk sausage, and not stuffed in casings.

Liver and blood sausages. For liver sausage use 25 pounds of pork trimmings, such as the head and feet, 12 pounds of beef or veal, 5 pounds of pig liver, 3 to 5 pounds of dry bread, a small amount of sweet marjoram, 1 ounce of allspice and a small amount of pepper, if desired. Cook the pork and beef or veal thoroughly, when cool cut the meat and the liver into small pieces and put them through a grinder. Squeeze the bread, which has been soaked in water, dry and put through the grinder with the meat; to the whole mixture add the seasoning and about 7 pounds of the soup in which the meat was cooked. Thoroughly mix the mass and stuff it into beef casings. Cook in water just below the boiling point until the sausages begin to float. For blood sausage use hog blood instead of liver and stir it continually when catching it to keep it from clotting.

Head cheese. This is really a sausage not a cheese and is made from the head, feet, tongue, and heart of the hog. Thoroughly clean the head and feet, removing the toes, eyes, and brains and cut the head into suitable pieces for cooking. Cook until the meat is easily separated from the bones; save the soup. Chop the meat fine and again put on to cook, using enough of the soup to cover it and adding salt, pepper, and sage to suit the taste. Cook for about 20 minutes then pour the mixture into shallow pans or crocks and allow to cool until it sets or hardens.

Scrapple. This is made from pork generally only the head and feet though any part of the carcass may be used. Cook the meat until it comes from the bones then chop it fine and put it back into the vessel in which it was cooked. Add salt to suit the taste and enough of a mixture of cornmeal 9 parts and buckwheat flour 1 part while stirring constantly, to make a thick mush. Pour the mixture into a shallow pan and allow it to cool, when it may be sliced and fried.

Trying out lard. Fat from the various parts of the pork carcass, as well as the kidney fat, must be rendered out for lard. The paunch and gut fat should not be included with the rest of the raw material. Remove all particles of lean meat and cut the fat into small squares or grind it through the coarse plate of a meat cutter. Fill a kettle with the material, keep up a steady fire under it, and stir frequently to keep the fat from settling to the bottom and burning. Cook until the cracklings float and take on a brown color. Allow the material to cool slightly, then draw it off and strain it through a fine wire mesh or cheese cloth. It is best to stir lard while it is cooling, so as to give it the desirable white color. It should be stored in a cool place in crocks or tubs.

By-products of Butchering

In the large packing houses, the utilization of the "offal" or non-edible products of all animals slaughtered has become an industry in itself. Practically every part of the animal that can not be used as a food product is converted into useful material of various kinds. This industry is the result of years of constant study and experiment by the packer in his efforts to overcome losses which

formerly occurred in connection with wasted bone, blood, hair, etc. He has found that it pays to provide the machinery needed for converting these raw materials into valuable commercial products.

The farmer and local butcher can not make use of many of these by-products because they do not handle the materials on a large enough scale to make it pay to attempt to convert them into usable form. The necessary machinery for the proper manufacture of by-products is usually extensive and expensive, while the raw material is cheap; consequently a large and constant supply must be available.

By-products that Cannot be Eaten

Nevertheless a number of products need not be wasted, but can be turned to good account even on the farm or in the small slaughter house. Among the more important of these are the *hides* and *pelts*, for which there is a ready sale on the open market at all times. The only requirement is that they shall be in good condition. The *bones*, *rough tallow*, internal organs and waste material of similar nature can usually be sold to soap rendering plants, if any are located conveniently near; if the material must be shipped by freight, its low value will hardly justify the trouble and expense. The *tallow* can either be rendered and sold as such, or shipped as rough tallow to rendering plants. Bones can be put through a bone grinder and sold or used on the farm as a poultry feed for which there is usually a demand. Many small slaughterers or local dealers could make fresh cut bone an important item in connection with their meat trade.

The *casings* or intestines from the different animals may be cleaned and used fresh for holding sausages, or cleaned, put in pickle and used when convenient, or sold on the market. If only a few casings are used it will not pay to clean them, as they can usually be purchased at a very reasonable figure. If to be cleaned, remove the fat and rinse them thoroughly by pouring warm water through them to flush out the contents; then turn them inside out and wash and scrape them to remove the inside lining.

Calf stomachs for cheesemaking. The fourth stomach or "rennet" of milk fed calves may be preserved by salting or drying and sold for cheesemakers' use. Makers of dairymen's supplies are usually in the market for properly preserved rennets, for which they pay about 25 cents each.

When a calf is killed, remove the "rennet" along with a small portion of the "book" or third stomach, by first cutting across the book about an inch above the rennet and then cutting off the lower end of the rennet about an inch above the point where it joins the gut. Squeeze the contents of the stomach out through the lower end, and clean the outside by trimming off the fat and rinsing. Do *not* use any water on the inside of the rennet, or it will lose its strength, but clean thoroughly

the small portion of the book attached to it. Now blow up the stomach like a bladder, tie the ends with string, and hang it up to dry in a cool, airy place, protected from flies; or if it is easier salt it as follows:

After cleaning, split the rennet open the whole length, stretch it well, and salt it heavily with dry salt on both sides. Do *not* use brine. After draining with plenty of salt for at least 2 days, string it on a pointed stick which is then nailed up in a shed or any dry place where there is plenty of draught. When partly dry, stretch it well, or it will dry very slowly. When fully dried, such rennets will keep well in a cool, dry place for a long time. Rennets having a bad odor, or a pink color are more or less spoiled and useless for cheesemaking. The main supply of rennets formerly came from Bavaria in Europe, but now the stomach of every calf slaughtered in the United States should be saved for the benefit of the American cheese industry (J. L. Sammis).

Commercial Packing House By-products

Bones. Large accumulations of bones are usually put into cooking tanks, where the fat and glue material are extracted. After coming from these tanks, they may be used for making bone meal, bone fertilizers, and for the manufacture of buttons, knife handles and a large variety of ornamental articles. Different treatments are given the bones used for the different purposes.

Fat. A large amount of the kidney and better grade fat from beef cattle is used in the manufacture of oleomargarine. The lower grades are used in the manufacture of soap.

Horns and hoof. These are removed and given a special treatment which does not destroy their density so that they can be polished and used in the manufacture of toilet and other fancy articles.

Blood is run into large tanks where it is made into blood meal, tankage, and fertilizers.

Entrails. The internal organs are taken care of as soon as they come from the killing floor, the intestines being trimmed of all fat, cleaned with water, scraped, cut into standard lengths and put into a pickle to prepare them for use as sausage casings. These are either

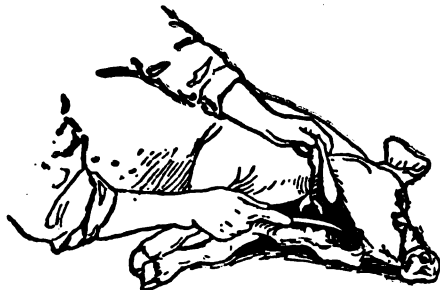


FIG. 583. Removing tongue before raising hog carcass

used in the packing house or sold on the retail market.

Hair and bristles are dried and bleached, the longer swine bristles being used in the manufacture of brushes, and the usual run of hair being cleaned and sold to mattress manufacturers.

Much of the material of too poor a grade to be used for any particular purpose is put into tanks, where it is manufactured into a fertilizer tankage.

Edible By-products

A large number of edible by-products may be handled and prepared on the farm, and others economically produced there.

Brains from the various classes of meat animals can be used for food and are regarded as a delicacy in many sections. They should be removed by splitting the head through the centre, being careful not to cut the brain. They are usually surrounded by a thin membrane, and may be bloody if the animal was stunned at the time of slaughtering. This membrane should be removed and the brains thoroughly washed in clean, cold water; if bloody they should be placed in salt water which draws out the blood. For table use they are usually rolled in flour and fried, or scrambled with eggs.

The tongues of all slaughtered animals are used for food either fresh or pickled and smoked. They should be washed or scraped clean at the time of slaughtering.

The heart is the only organ from the chest cavity commonly used as an article of food. It may be roasted, fried, pickled, or for making hamburger or sausage.

The liver must be used soon after it is taken from the carcass, unless it can be frozen. It

may be fried and is often worked into different kinds of sausages.

Other minor edible products, such as the kidneys, sweet breads, ox-tails, etc., are saved and prepared for cooking. Many articles classed as by-products have already been discussed under sausages and miscellaneous meat products.

Disposing of hides. Hides must be properly cared for as soon as they have been taken from the animals. In warm weather salt them and allow them to cool; in cold weather they may be allowed to cool without salting. After the animal heat is out, roll each hide into a compact bundle and tie it with a stout cord or light rope. Do not allow hides to lie spread out on a floor in a warm room, as they will dry out and lose in weight. It is better to attach a shipping tag and ship at once to some hide dealer, or sell to the local butcher. Whether shipped or sold locally, state the condition of the hides with reference to number of cuts, etc. An exact statement will mean a better price than a misrepresentation or no statement at all. Hides can always be shipped by freight; it is cheaper than express, and if properly prepared, they will reach the market in fully as good shape. Be sure that the shipping tag is securely fastened to the bundle, and that it is properly addressed.

Pelts (see also Chapter 48). Sheep pelts may be shipped in the same manner as hides, except that more than one can be put in a bundle. They should be salted during warm weather. In piling them one on top of the other, place them so that the inside surfaces of 2 hides come together; this prevents the salt getting into the fleece to any great extent. The number to put in one bundle will depend upon their size; 6 makes a very convenient bundle although a greater or smaller number can be tied together. Tie and ship in the same manner as hides.

Tanning on the farm. Hides and pelts may be tanned on the farm, but it is usually not a paying proposition. It takes a considerable time to properly treat them and involves considerable expense in the form of equipment and materials. It is more practical to sell the hides and purchase such leather or other articles made from hides as may be needed. If to be used for robes or rugs, hides can be sent to manufacturers who make a practice of preparing such articles; the result is high class work, usually at a very reasonable figure.

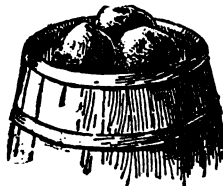


FIG. 584. Keep pickled meat under the brine by means of a board and some stones



CHAPTER 47



Handling Wool and Mohair on the Farm

By L. L. HELLER, Assistant Secretary of the National Wool Growers' Association, formerly associated with the U. S. Bureau of Animal Industry, later with the National Wool Warehouse and Storage Company of Chicago, and then with the Editorial Department of the "Field Illustrated." The system and care with which the farmer markets his products often decides whether he shall reap profit or loss; this is especially true in the case of wool, which in 1915 was produced in the United States to the extent of 36,698,000 fleeces or 288,777,000 pounds, and in 1916, 1917 and 1918 to the extent of 288,490,000, 281,892,000, and 299,921,000 pounds respectively.—EDITOR.

Washing Sheep Before Shearing

THE practice of washing sheep before shearing is falling into disuse. Years ago it was common in our Eastern states, and it is still done in a limited way in eastern and southern Ohio, and the adjoining parts of Pennsylvania and West Virginia. The sheep are either driven a number of times through a pond or stream dammed up for the purpose, or they are held in the water and the dirt squeezed out of their fleeces by hand. More or less of the wool grease which is not soluble in water remains in the wool, but most of the dirt and suint (soluble potash salts excreted from the skin), is removed, if the washing is thoroughly done. It is customary to delay shearing a week or 10 days after washing, to permit the fleeces to dry and to allow the grease to rise again in the wool, as this makes shearing less difficult.

Prices of Washed and Unwashed Wools

A higher price per pound is paid for washed, than unwashed wool solely because of its lighter shrinkage (grease and dirt present). As some farmers did not wash their sheep clean, or delayed shearing until they had again become dirty, a third grade midway in shrinkage arose, known as unmerchantable. It varies in price between the other 2 grades.

As all the grease is not removed even by the most careful washing, washed as well as unwashed wool has to be scoured before being manufactured, consequently the millman is not benefited by the washing. Since it is becoming less common, it is questionable whether the slightly higher prices of washed wools are sufficient to offset the extra pounds of unwashed, to say nothing of the labor involved. Certainly the farmer gains nothing by the operation.

Wool quoted as washed or unmerchantable

on the market does not necessarily come from washed sheep, but frequently represents light and medium shrinking fleeces, both washed and unwashed. The fact that the two are mixed proves that washing has not benefited the wool in any way. The millmen attempt to buy washed and unwashed wool of similar grade at the same price per clean pound, and this will doubtless entirely discourage the practice in time. Australia has discontinued washing for the same reasons that have worked against it in America.

Tub Washed Wools

Tub washed wool (that has been washed after being shorn) is sometimes quoted on the St. Louis market, but little tub washing is done at present, and it should be discontinued. Most fleeces are sorted according to quality before being made into cloth, and washing them makes this extremely difficult, if not impossible.

Time of Shearing

Early shearing is usually preferable. Fleeces shorn after the sheep are out on pasture are more apt to be taggy, or encrusted with dung locks. The lambs suckle better from shorn ewes and are less likely to swallow wool balls. Shorn ewes are more likely to find shelter in bad weather, which is also beneficial to the lambs. The Ohio and Michigan Experiment Stations have found early shorn sheep to yield slightly heavier fleeces than late shorn ones.

The benefits of having the sheep in short fleece during hot weather are recognized in Texas and southern California, where many sheep are shorn twice a year. It is claimed that they average about a pound more wool than when shorn only in spring, but the smaller price per pound obtained because of the shorter staple probably offsets this advantage.

Precautions to be Taken Before Shearing

Immediately before shearing keeping the sheep dry is the principal one. "Sweating" is practised to some extent among the big flocks of the West and consists of keeping enough sheep for the next day's shearing crowded in a close shed over night. It is claimed that sweating causes the yolk or grease to rise in the wool, increases the weight of fleece, and makes shearing easier. But such increased weight adds no actual value to the wool, and must eventually result in a lower price per pound.

To increase the value of the wool. All through the year keep the flock healthy and keep all kinds of burrs out of the pasture fields. Sickness, a rapid change of feed and other factors affecting the sheep's health generally result in tender wool. Often a well defined break, representing a crisis in the sheep's life, is noticeable in the fibres a uniform distance from the end. It has been aptly said the fleece is a mirror of the sheep's health, through the period which it grew. Tender wool will not successfully withstand combing in the manufacture of worsted cloth, and consequently must be used like the shorter wools for making woolens and felts. As these are usually cheaper goods, tender wools are worth several cents a pound less than strong, robust staple.

Burrs always sell at a disadvantage sometimes amounting to 6 or 8 cents a pound. Three factors cause this lower value: (1) burrs add to the shrinkage of the wool or reduce the percentage of clean yield; (2) it is an expensive operation to remove them; and (3) damage is done to the wool fibre by all known methods of removal. Special burring machines and the burr rolls on the worsted card, together with the comb itself remove the burrs from the worsted or combing or combing wools (strong wools $2\frac{1}{2}$ inches or more in length), but many of the fibres are broken in the process. The comb removes the burrs from the "top" (the long combed fibres laid parallel in a continuous strand) that go into the worsted yarn, but leaves more or less of them in the "noil" (the short, broken, tangled fibres removed by the comb). Burrs in short clothing or felting wools, if of the kind that break up readily, and in noils, are frequently removed by carbonizing. This consists of treating the burr wools with dilute sulphuric acid or other chemicals, drying, heating to certain temperatures to char or carbonize the burrs, crushing them and then blowing them out. When only a little foreign matter is present carbonizing may be done after the cloth is manufactured. However, it is an expensive process, and while the chemicals used are supposed to have no harmful effect on the wool, it is generally admitted that the fibre is weakened by the operation. For this reason combing wools are rarely treated.

Hayseed, chaff, and alfalfa should be kept out of the wool, as far as possible.

Feed racks should be arranged so that it is not necessary to carry the hay over the sheep's backs, or else the sheep should be turned out while the racks are being filled. The slats should be close enough together to prevent the sheep getting their heads through, under the hay. The flock should not have access to hay or straw stacks, if the fleeces are to be kept clean.

Avoid branding with paint as far as possible, and when necessary use a soluble paint. Those containing tar or linseed oil will not scour out, and because they have been extensively used manufacturers are unwilling to take chances, even with paints that are said to be soluble. Consequently, all paint locks or branded wool are separated and used for cheap felts, etc.

Where to Shear

The size of the average farm flock does not justify the building of a special shearing shed. In a central sheep barn a space of 8 or 10 feet square can be cleared in the driveway; or, one of the sheep sheds (which are often to be preferred to the central barn because of their better facilities for controlling parasites) can be used. Good light is absolutely essential. If the building has not a fairly smooth floor that can be swept clean, provide a solid, firm platform of planed boards about 8 feet square (8 by 16 for two shearers). Some shearers prefer a bench about 18 inches high, upon which to place the sheep.

The catching pen may be a temporary affair of hurdles; or it may be convenient to shear near one of the permanent sheep pens, in which case the sheep can be taken direct from it. If this catching pen is near the shearing board, it will lessen the work for the shearer and is better for the sheep, too. In the big shearing sheds in the West, instead of a single gate between the shearing board and the catching pen, two doors are hung to swing either way. The shearer can enter the pen, get his sheep, hold it with both hands and back out without likelihood of others following. A cheap, convenient substitute for these doors is a woosack, hung across the opening of the pen. The sheep will rarely shove the sack aside and come out, while shearing is going on unless forced to.

Where the flock numbers several hundred, a separate pen should be provided for the shorn sheep, to prevent the excitement of separating the unshorn from them, but with the average sized flock, this is unnecessary. On the range shearing sheds frequently have chutes leading to pens on the floor below, through which the sheep are pushed when shorn.

Catching the Sheep

Catching sheep by the hind leg, dragging them out of the pen and twisting them over on their backs, known as "legging them out," is too common in America. No objection can be offered to catching a sheep by the hind legs, just below the flanks, until a better hold can be secured, but the correct way to take a sheep out of the pen is to approach its left side from behind, reach over the shoulders and grasp its right fore leg, raise up, turn it over on its rump and back out of the pen. The sheep, its back to the shearer and its legs just off the floor is then in a position to be shorn.

Machine and Hand Shearing

Machine shearing offers several advantages over hand shearing and has become increasingly popular in America during the past 25 years. The machine is easier to operate than hand shears, except when shearing heav-

ily folded fine wool sheep; less skill is required to operate it; sheep can be shorn more rapidly; there is less "second cutting" of the fleece; and the sheep are more closely and smoothly shorn.

In the West, where sheep have only natural shelter, objections have been raised to machine

shearing. Extremely cold weather after close shearing, has resulted in heavy losses of sheep there, and unseasonably warm weather has caused blistering; but these objections do not apply in the farm states. One- and two-stand machines, run by small gasoline engines and suitable for farm flocks have been on the market for some years. A hand machine that works by a crank is also offered, but it has the disadvantage that it takes 2 to operate it.

Machine shearing is best done by first opening up the neck, starting at the breast bone, then shearing the belly, which may be separated from the main fleece. Some prefer

to shear the belly first. The shearer's stroke should be as long as possible, the sheep should be held so its skin is taut to prevent cutting, and the hand piece should be held close to the body, so second cutting will not be necessary. If the sheep is held right, it will not struggle, and the wool will roll back after each stroke and not be in the way of the shearer. The main fleece should be removed in 1 piece as far as practicable, but in short stapled wools, this is impossible. Hand shearers usually start on the left side between the flanks, before or after opening up the neck, shear around the back and the right side and finish the belly last.

Tying and Packing

After removing the fleece, spread it out cut side down, remove the tags and double the two sides in, so that it can be rolled up into a bundle about 2 feet wide. By rolling the britch in first, you bring the shoulder wool which is the best of the fleece, on the outside and buyers expect this. Having the cut edge on the outside gives the fleece a better appearance. Roll the belly wool on the inside of the fleece, as the size of the farmer's clip does not justify packing it separate. Keep out hay, chaff, and foreign material. A skirting table $4\frac{1}{2}$ by 9 feet and $3\frac{1}{2}$ feet high with rollers 2 inches in diameter and $\frac{1}{4}$ inch apart, forming the top is convenient for rolling the fleeces on if there are 200 or 300 in the clip. With a little practise they can be thrown over this table like a table cloth, cut side down, the tags removed, and the rolling and tying easily completed. The spaces between the rolls permit the dirt to fall through.

Twine for tying. When sisal or binder and jute twines are used to tie fleeces, fibres get into the wool and damage the cloth made from it because they will not spin nor take the wool dyes. For this reason paper twine has been placed upon the market in length of 8 or 9 feet suitable for tying fleeces. If pieces of this twine get into the wool they do no harm, being dissolved in the scouring liquor or removed in some later stage of manufacture.

Place the twine beneath the centre of the rolled fleece, wrap around once, tie tightly in a single knot, wrap the other way and tie securely in a knot that will not slip. In the big western clips that are graded and baled at the shearing corrals the fleeces are not tied but as grading is impractical on the farm, the wool must be tied so that it can be graded at the market. The short 6 months wools of Texas and California come to market untied, but are so uniform that they do not require grading.

A packing frame about 9 feet high, and strong enough to hold the weight of a bag of wool and the man tramping it is convenient where only a few fleeces are grown. In the top is a circular hole about 2 feet in diameter, or slightly smaller than the mouth of the wool sack. A half inch iron or strong wooden hoop slightly larger than the hole, holds up the wool sack, the mouth of which is wrapped back for 8 or 10 inches over it. The bottom of the sack should swing clear of the ground when hung through the opening in the frame, and the wool should be tramped after each 3 or 4 fleeces are added, as well packed bags are handled more easily than poorly packed ones.

Pack the black fleeces separately, or if there are only a few, place a paper between them and the others, for if packed with the other wool it will damage it, small black locks or fibres adhering to adjoining white fleeces and marring any light goods made from them. Pack buck wool also, especially from fine-wool bucks, by

itself. Wool from dead sheep should not be put in with other fleeces, and wools varying widely in quality, length, or condition and therefore in value should not be mixed in the sacks.

Selling Farm Wools

Boston, Philadelphia, Chicago, and St. Louis are the principal American markets for domestic wools while New York handles some domestic and a large amount of foreign wools. Boston is by far our largest market and is second only to London, the world's greatest wool mart. One reason for this is that most of our worsted and woolen mills are located in the New England and Eastern States.

Before reaching the large markets, a considerable part of the farm wool is handled by local men, who carry it more or less as a side line. Some of the local buyers act merely as agents for the big city wool merchants while others buy and sell independently. The country stores frequently deal in wool. Wool is often bought at a lump price per pound, but the more progressive dealers distinguish according to quality and condition.

The lamb clubs of Tennessee, which are made up of communities of sheep farmers, gather the wool of their members, grade it roughly, and offer it for sale. Past sales have been very successful and the clubs, by handling a larger offering of wool, have been able to command more distant competition, and have realized higher prices. Local woolen mills have occasionally bought this wool but as indicated before, most farm wools are bought and sold two or three times before they reach the manufacturer. Collective selling of wools has taken place to a limited extent at other points in the South. At San Angelo and Kerrville, Texas, several million pounds are sometimes gathered into the warehouses and offered at single sales.

In the Western states where the individual clips often aggregate 100,000 to 500,000 pounds, buyers representing the Eastern dealers deal direct with the wool growers. Indeed the wool is often sold months before it is grown. This is known as "contracting on the sheep's back," and as a general rule is poor policy from the growers' standpoint. If the grower does not wish to sell his wool immediately after shearing, he may consign it to one of the Eastern wool houses, to be sold on commission. A charge of 1½ cent per pound is generally made for handling it. Usually the grower is permitted to draw on his wool to the extent of 75 per cent of its market

value, as soon as it is shipped, paying the current rate of interest on the advance, until the wool is sold. A wool-growers' selling agency, known as the National Wool Warehouse and Storage Company, controlled by the Western sheepmen, was organized in 1908. It has offices in Chicago, Boston, and Philadelphia and handles wool solely on commission. This company started the practice in America of grading and baling the wool at the shearing sheds of the big Western sheep outfits in readiness for direct shipment to the mill. Pools of Western wools are occasionally formed and a number of local sealed-bid sales are held each season. A warehouse company has also been formed in the Northwest, with headquarters at Portland, Oregon.

Farmers who are not getting full value for their wool have two courses open to them. The first is to combine their clips until they have an offering that will command greater attention. Where a carload is gathered, there is the additional advantage of a lower freight rate. The farmer growing the best wool is not likely to get its full value and the one growing the poorest is likely to get more than his clip is worth, but the arrangement should prove more satisfactory all around than if 2 or 3 profits are taken from each clip before it reaches the millman. Rough grading, such as the farmers could do would probably never make subsequent grading at the market unnecessary, but it would insure every farmer getting more nearly what his individual clip was worth, where each grade is valued or sold separately.

The second way to get full value is for the farmer to grow a uniform grade of wool. There is no reason or excuse for having a farm flock growing three or four different qualities. If the sheep growing the finest grade is the ideal sheep for local conditions the coarse fleeced one is out of place. When high grade or purebred sheep are raised more extensively, this condition will cease to exist. Special areas of England are largely devoted to certain breeds, and the wool from these sections is so uniform in character and quality, it takes as a grade name the name of the breed of sheep that produces it. Careful breeding on American farms would make any grading there unnecessary and would enable the wool to sell at more nearly its true value.

Factors Affecting the Value of Farm Wools

Condition. In connection with grease wools (as they come from the sheep's back) this refers to the amount of grease and dirt present and is used interchangeably with shrinkage. It is the factor of greatest im-

portance in fixing the value of wool. Dealers familiar with wools can estimate their shrinkage within 1 or 2 per cent by handling, and unless operating on a wide margin of profit because of limited competition, they pay

according to shrinkage, or rather according to yield. Fine Merino wools shrink 12 to 18 per cent more than the coarsest braid wools such as grow on Cotswold or Lincoln sheep grown in the same section of the country. As a general rule the finer the wool, the heavier the shrinkage. Short wools usually shrink more than long wools of similar quality, and those from west of the Mississippi River, especially the fine wools, shrink 8 to 10 per cent more than those from the Eastern farm states. While shrinkage in any Eastern locality is fairly uniform from year to year, on the Western ranges it may vary as much as 6 or 8 per cent from season to season. A certain amount of grease is necessary to preserve the fibre, but farmers will do well to breed away from the heavy, soggy, short stapled fleeces that have been common in some parts of the East and Middle West.

Grade is second in importance in determining the worth of wool and is made up of length and strength of staple, and quality or fineness of fibre. According to length and strength, wool is divided into combing and clothing grades. In days gone by fine wools less than 2½ inches long and coarser wools of somewhat greater length, as well as very tender (weak) wools could not be successfully combed. Consequently they were not suitable for worsted goods (in which the long fibres are laid parallel in the yarn) but must go into woolens or felts, where shortness of

fibre is an advantage. This condition gave rise to "combing and clothing" wools. Alterations and improvements in textile machinery have now made it possible to comb almost any wools, but the divisions according to length still prevail. The better, so-called "clothing wools" are frequently combed on the French combs, and occasionally grades known as Baby or French Combing, midway in length between combing and clothing have been taken from lines of wool yielding little or no true combing or staple. The poorer clothing wools are not combed at all; the operation as applied to them is unprofitable. Combing wools are worth from 2 to 5 cents more per grease pound than similar clothing wools, hence the farmer should select and breed long-stapled sheep when other conditions are equal or nearly so.

American market grades. The American market wool grades according to quality are Fine, Half-blood, Three eighths blood, Quarter blood, Low quarter and Braid. The *Fine* grades come from Merino or Rambouillet sheep. *Half-blood* is one grade lower in quality, and commonly comes from coarse, purebred or high grade Merinos. *Three eighths blood* is just below half-blood and would be represented by a typical Southdown or fine Shropshire fleece. Most wools lower than Three eighths blood in quality have enough length to grade as combing. *Quarter blood* might be represented by a low quality Shropshire, Dorset, or high quality Oxford, while Low quarter might come from a coarse Oxford, a Cheviot or high grade Longwool. *Low quarter* is sometimes called Common. *Braid* or *lustre wool* comes from Cotswold, Lincoln, and Leicester sheep. The difference between it and Low quarter is in lustre rather than quality and the two grades are often thrown together. It gets its name from the fact that it is used in making braid, but it is also used for dress goods. The terms Half-blood, Three eighths blood, Quarter blood, etc., do not in any way indicate the breeding of the sheep from which the wool came, but are simply grade names. At one time they were supposed to indicate the amount of Merino blood in the wools, but crossbred sheep do not produce uniform wool even when of similar blood lines and there is an average difference of perhaps 2 or 3 grades between Southdown-Merino and Cotswold-Merino crossbred wools, containing equal amounts of Merino blood.

The fine combing wools of the farm states are commonly called Delaine wools but they do not necessarily come from the Delaine-Merino sheep. XX and X in wool market quotations refer to washed clothing wools of fine grade. As stated under "Washing the Sheep," the washed and unmerchanted grades are of lighter shrinkage than the unwashed, either because of washing or for natural reasons.

Other things being equal the finer the grade,



FIG. 585. The correct way to open a fleece to examine its depth, quality, and texture

the higher its value per clean pound. Between the finest and coarsest American grades the value frequently varies from 10 to 20 cents per scoured pound, but because of the heavier shrinkage of the fine wools, the medium and low grades sell for more money per pound as they come from the sheep's back. Unusual conditions creating a special demand may change, temporarily, relative values of the grades.

Character, which also affects the value of wool, is not so easily defined as condition or grade. In wools of good character, the crimp or waviness of fibre is pronounced and uniform. The fibres lay parallel in the natural locks, into which the fleece naturally tends to divide. Almost the opposite condition prevails in frowy fleeces lacking character

which, under certain conditions (especially the lower grades) felt together and form "cotts." According to the degree to which cotting has taken place, cottas are divided into soft and hard. Hard cottas must be run through a special breaker before they can be made into cloth. A good many fibres are broken in working up these cotted fleeces, consequently the percentage of noil is greatly increased and the value of the wool correspondingly lowered. Wools of good character are lustrous and lifelike, while those lacking it have a dull or dead appearance and are sometimes tender as well. The term character is sometimes used to include uniformity of quality. As character makes a difference of several cents a pound in the value of wool, it is taken into consideration in grading large lots.

Handling Mohair

Mohair is the fleece of the Angora goat (p. 122). While longer, more lustrous, and less crimped than most wools, it resembles lustre or braid wool to such an extent that a certain amount of the latter can be blended with it for making certain goods and cannot be detected by experts. In 1910 there were practically 1,500,000 Angora goats in the United States, the majority in Texas, New Mexico, and Arizona. While increases have been reported from some sections, it is questionable whether the total has changed materially since that census was taken.

Because of the climatic conditions, part of the goats of the Southwest are shorn twice a year, in February, March, or April and again in September or October. Both hand and machine shearing are practised. The average year's fleece weighs about 3 pounds. Fleeces are not tied but rolled up, weather side out and sacked. The most valuable mohair comes from the kids—young wethers and does—and should be sacked separately. As the goats become older, the mohair becomes coarser, straighter, and less lustrous. Mohair should never be sacked with wool. It is usually worth several cents more per pound, and the mohair fibres will get into adjoining fleeces, which is objectionable.

Extremely kempy mohair should be packed by itself. Kemp is coarser, straighter, and less lustrous than true mohair fibre and of a deadish white appearance. Practically all mohair contains some of this fibre which, because it will not take the dye, and will not spin to advantage, lowers the value of the manufactured goods and of the raw mohair in proportion to the amount present.

In order to sell to good advantage mohair staple should be at least 6 inches long, and twice this length is preferable. Extremely long mohair, representing more than a year's growth, is in demand in limited quantities and for making switches, etc., fetches many times the price of ordinary mohair.

Foreign mohair is as a rule more lustrous and spins to better advantage than the average American, but the best American product is surpassed by none. Domestic mohair shrinks about 17 per cent and foreign, on an average, 14 per cent.

Manufacturers say that American mohair has improved greatly during the past few years, in regard to both length and freedom from kemp. A large part of our mohair clip is marketed through the National Mohair Growers' Association, a coöperative institution with offices at Boston, Mass. A number of growers consign direct to the mills, the largest of which are the Sanford Mill at Sanford, Maine, and the Massachusetts Mohair Plush Company, Lowell, Mass. As many sheepmen also run a few goats, most of the wool houses sell their mohair for them as a matter of accommodation, the mohair coming to market with the wool.



FIG. 586. The gray wolf furnishes a beautiful and valuable pelt

CHAPTER 48

How to Handle and Market Furs

By D. E. LANTZ, late Assistant Biologist of the U. S. Biological Survey, and a recognized authority in all matters relating to American wild animals, their history and habits, the good and harm they do, their protection, destruction, and use.—EDITOR.

THE farmer often has need and opportunity to destroy animals that prey upon his stock or poultry or injure his crops, and of which the pelts may have real value. Yet for lack of knowledge about preparing them for market or home use he often throws these pelts away when with a little time and effort he could well make them useful and a source of good returns. Many farms are located near a forest, wooded stream, or marsh inhabited by fur animals which the farmer and his boys might very profitably trap during their spare time in winter. Success and profit in this work require some knowledge of the habits of fur bearers and of how to make their pelts yield the best returns, some of which can be gained from books on natural history and trapping; but much may be learned by studying the animals themselves and the methods employed by good trappers.

What and when to trap. The use of furs is constantly growing; raw furs have advanced greatly in value and those that formerly were neglected in the trade are now popular. But the better kinds of fur animals are becoming scarcer each year. The clearing of forests, the draining of marshes, and close trapping have thinned them out and made it highly important that care should be taken to prevent extermination of the species whose pelts are in great demand. Many farmers think that because an animal is sometimes harmful to poultry, it and all animals like it should be killed whenever a chance is offered. We may grant the right to protect property, but let us remember that it is one particular animal



FIG. 587. Some common types of trap for the farmer's use. (Hercules Powder Co.)

that raids the poultry house; the warfare that follows should be against it and not against the whole species. Where seasons for taking fur animals are not fixed by law, both farmer and professional trapper will profit by waiting until cold weather matures the fur. The fox, mink, skunk, or weasel killed in summer is worthless as a source of fur; if allowed to live until winter it yields a pelt of considerable value. To continue trapping in the spring after the breeding season begins is another way to endanger the future fur supply.

Farmers should keep informed about laws of their state as to the capture of fur and game animals. Open seasons vary greatly in the different states and Canadian provinces, in many of which a trapping license is required, though some concede the right to trap on one's own lands without a license. Permission to trap on another's land is required in some states; the dens and houses of such animals as the beaver, muskrat, and

skunk are often protected; and in certain states the possession and sale of pelts are regulated by law. Bulletins of the U. S. Department of Agriculture give much of this information from year to year.

How to kill game. When a trapped animal is found alive, the best way to kill it is to give it a quick blow on the back of the head with a short, rounded club. Use a gun only when absolutely necessary, and then a .22 rifle, shooting the animal through the eye so as to do the least possible damage to its pelt. A

trapped skunk may be lifted with a running noose attached to a long pole, then either strangled or carried to water and drowned; but a sharp blow across the middle of its back, paralyzing its hind quarters, will usually prevent a discharge of its scent. A dead fur animal should never be roughly handled, dragged along the ground, or thrown into a bag with others, but should be carried hung by the head or hind feet. Skin the animal, whenever possible, before it is stiff or frozen.

How to Skin Pelts

Furs for market are prepared in two ways: (a) "open," and (b) "cased," that is, without being opened along the belly. Most pelts are sold in the latter shape, though beavers, raccoons, moles, squirrels, rabbits, and all the larger skins intended for rugs or mats are dried open or flat. Wolf, coyote, and wildcat are prepared in either way, the better skins from the North being cased, and those from the South and Southwest being usually marketed flat.

How to skin a cased pelt. (1) Begin at the middle of a hind foot, and with a sharp knife slit up the rear edge of the leg to the under side of the tail and down the other leg to the middle of the other foot; no other cut in the body of the animal is needed. (2) Cut around the heels of the feet, and turn the skin back over the body. (3) Strip the skin carefully from the tail bone with the hand, if it comes readily; if it does not slip easily, place a split stick over the tail bone, grasp it firmly in the hand, press the thumb against the back of the animal just above the tail, and pull. (4) After skinning the tail continue turning the skin back over the body, using the knife only when necessary to cut ligaments. (5) To avoid tearing the skin, take care to cut around the nose, mouth, and eyes. The cartilage at the base of the ears should be skinned out.

The tail of an otter should be split down the under side and entirely skinned out; that of a muskrat or a beaver is cut off. Some trappers open up the tail of a skunk the whole length, as is done with the otter. If it is pulled out of the skin, an accumulation of blood is often left inside the pelt at the tip; but a short slit on the under side near the tip will admit air and permit the tail to dry properly. Tails of other fur animals skinned for casing may be treated in the same way.

How to skin an open or flat pelt. (1) Make a cut along the middle line of the under side of the animal from the base of the tail to the chin. (2) At right angles to this main cut, slit down the inner side of each leg to the foot. (3) Cut around the heel and turn back the skin until it is all free from the body. (4) In treating tail, ears, eyes, nose, and mouth, follow the same directions as given for a cased skin.

The fresh skin should have all loose fat and muscle removed, after which it should be stretched and cured if for market. If to be used at home, it may be tanned at once or cured so as to keep properly until it can conveniently be tanned.

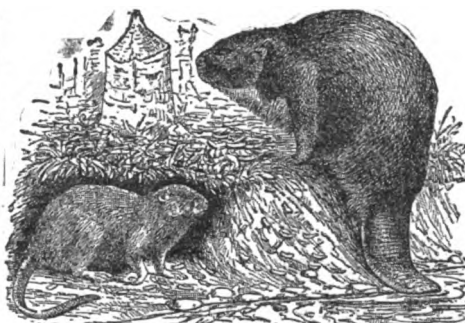


FIG. 588. Two valuable fur-bearing water animals: muskrat (left) and beaver (right)

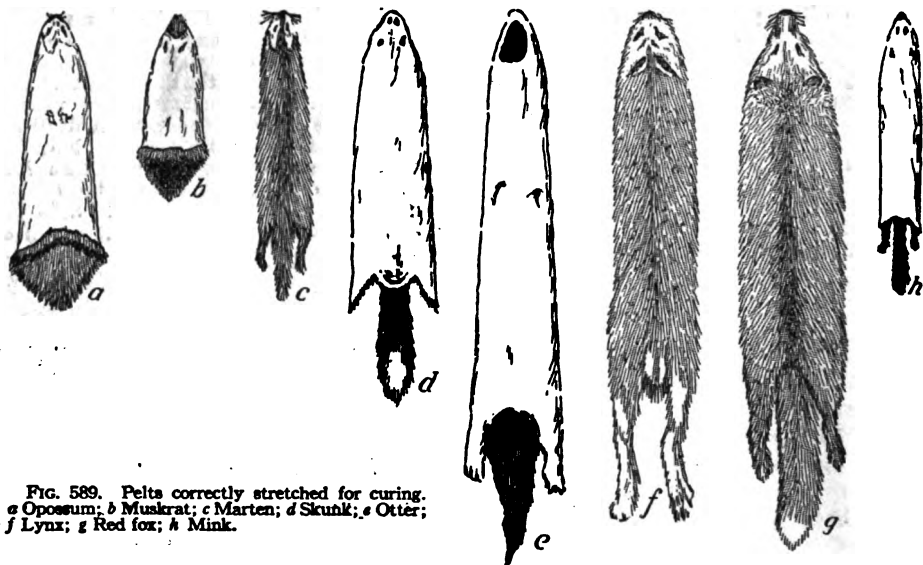


FIG. 589. Pelts correctly stretched for curing.
 a Opossum; b Muskrat; c Marten; d Skunk; e Otter;
 f Lynx; g Red fox; h Mink.

How to Cure Pelts

Skins are cured by being stretched free from wrinkles, then dried in a cool, shady place where there is free circulation of air. Flat skins are usually tacked on boards or frames, flesh side out. Cased skins are dried, also flesh side out, on "stretchers" or thin boards or frames of proper size and good shape. Some furs are removed from the stretchers before they are fully dry and turned fur side out; the more common pelts go to the market flesh side out.

Stretchers. Board stretchers of convenient sizes are an important part of a trapper's equipment, but frames of heavy galvanized wire are also used. A stretcher for mink skins should be about 30 inches long and $3\frac{1}{2}$ to $4\frac{1}{2}$ inches wide; for fox skins, about 4 feet long, $6\frac{1}{2}$ inches wide at the base, and 5 inches at the shoulder; for an otter skin, a foot longer and half an inch wider than for a fox. A three-piece stretcher is often used, made, as shown in Fig. 590, of 2 long pieces and a wedge which is driven between the other parts after the skin is adjusted. Take care not to stretch furs too much, as there is danger of thinning the fur and destroying its lustre. A few tacks at the edge of the skin will avoid wrinkles and aid the drying process. The value of a pelt depends greatly on its condition; care should *always* be taken in the curing process.

If you have or expect to have furs for sale keep informed as to prices by consulting winter issues of fur trade journals and free price lists published by many buyers of raw furs. The practice of advertising high prices to induce shipments is less common than formerly, and, as a rule, shippers may expect fair treatment in grading. However, when there is a reputable local dealer, it will generally pay to sell to him rather than to ship to a distant market. The proper grading of furs is an art known better to the experienced buyer than to the amateur trapper, and misunderstandings are more easily straightened out in the local market where buyer and seller can become acquainted. For shipping pack the skins flat or in a tight roll, wrap in gunny sacking or strong paper and tie securely. Use a shipping tag carrying your name and address and the words "Raw Furs."

How to Tan Pelts at Home

Skins for market should not be tanned; for home use they may be tanned with the hair on or off, as desired. If the pelt only is to be tanned, remove the hair by soaking the skin for 2 or 3 days in lukewarm water to which has been added 4 quarts each of wood ashes and quicklime to every 5 gallons. When the hair comes out readily on all parts of the skin, the soaking is finished and the

pelt is ready to be washed before going into the tanning liquor. The most satisfactory tanning solution in common use is made by adding a quart of salt and a half ounce of sulphuric acid to each gallon of water. Keep the mixture in a wooden or glass (not metal) tank; it may be used over and over. Any number of skins may be tanned at the same time, so long as each one is entirely covered

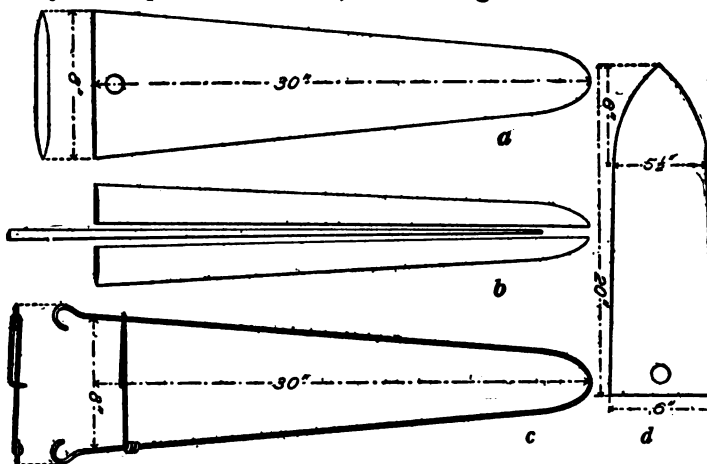


FIG. 590. Stretchers. *a* Board stretcher for skunk skins; *b* 3-piece stretcher; *c* Wire stretcher for skunk skins; *d* Wooden stretcher for muskrat skins

at all times so that the liquor may act on all parts of it. This solution will tan thin skins in a single day. Heavy skins require several days, although they may be left in the tank for any length of time without harm.

After removing the skins from the tanning liquor wash them several times in soapy water, wring them as dry as possible, rub them on the flesh side with a cake of hard soap, then fold them along the middle and hang them lengthwise over a line, hair side out, to dry. When both surfaces are barely dry, and the flesh side still slightly moist, lay them over a rounded board and scrape them on the flesh side with the edge of a worn, flat file, to remove the inner layer and make the skins white. Very thin skins must be handled carefully during this process; scarcely any of the fibre should come off. Finally rub, stretch, and twist the skins until quite dry. The results of the tanning depend largely upon the amount of work done upon the skins at this stage. If parts of a skin are still hard and stiff, the soaping, drying, and stretching should be repeated until the entire pelt is soft. Fresh butter, or other animal fat, worked into the skins while warm and then worked out again in dry, hardwood sawdust, or extracted by a hasty bath in gasoline, will increase their softness.

Fur Animals Commonly Taken in the United States and Canada

Badger. Badgers are found in considerable numbers only west of the Mississippi. They have no under fur, yet the skins, which are cured open, are of some use in fur manufacture, and the hide with hair removed makes good leather. Aside from its fur value, this animal is so useful as a destroyer of rodent pests that it should be protected by law.

Bear. Bears are protected as game in several states, trapping them is restricted in others, while a few states still pay rewards for destroying them. The skins are used chiefly for rugs, but many pelts are made into coats, sets, or trimming. The skins are cured open. When making a rug, skin the feet out leaving the claws attached to the pelt.



FIG. 591. A beaver skin correctly stretched

Beaver. This animal, having become rare in most parts of the United States, is now protected by a closed season in 9 states and at all times in 21 others. Only a few of the 17 that do not protect beavers, have any left. There are more in Canada, most of the Provinces having an open season for taking them.

Skins are cured open (the tail cut off), and stretched as nearly round as possible, the skin being sewed to a hoop.

Civet, see *Skunk*, below.

Fisher, see *Marten*, below.

Fox. The red fox has a fine pelage (covering of hair) but the pelt is not very durable. Nevertheless, fox fur has always been popular and commands good prices. The cross, silver, and black fox are color varieties of the common red fox, the silver and black being very rare, a raw fur bringing from \$300 to \$1,500. Foxes are prime from November to February. The skins are cased, but when not quite dry should be taken from the stretcher and turned fur side out. Gray foxes, common throughout the South, have a much coarser fur than the red fox; skins are therefore worth about half as much, but there is good demand for them.

House cat. Skins of domestic cats are used extensively in the fur trade, but only in cheap imitations of better furs, hence they bring very low prices. Large solid colored skins are most in demand. The best and largest are collected from animals that have lived in a wild state, in which, after a few generations, they nearly all show the uniform gray color of their original ancestors. Skins should be cased.

Lynx. The Canada lynx is still found in states along the northern border, in the higher mountains of the West and more commonly in most parts of Canada. The fur is beautiful and valuable. The skins should be cased, the feet being skinned out and left attached to the pelt.

Marten. This animal is by no means common in any part of the United States but some are still found in forested parts of states on the northern border and in the higher mountains southward. Skins are always in demand at good prices. They should be cased, then turned fur side out before quite dry.

The same remarks as to distribution, scarcity and treatment of their skins apply to the *Fisher* as to the *Marten*. The fur is always in demand, and skins, being larger, bring even better prices.

Mink. As a fur producer the mink has become less important than the muskrat, skunk, and, at times, the raccoon, but it is still reasonably common in many parts of

the country. Skins are of varying shades of brown, the darker ones being the more popular and always bringing the better prices. The fur is prime from the middle of November to the latter part of February. Skins are cased, flesh side out, but exceptionally fine ones are sometimes turned fur side out for the market.

Mole. Mole skins are in much demand, and our common eastern mole has fur of about the same size and quality as that of the European mole which has hitherto supplied the market. The mole of the Pacific Coast states is much larger, has a stronger and more durable pelt, with the same sheen as that of the European species; it should find a ready market at good prices. The Eastern and Middle States farmer may not care to market the skins of the smaller animal that bring but little money; however, he will find many uses for the home tanned pelts.

Muskrat. Muskrats inhabit marshes and streams in most parts of North America. The female produces young 3 or 4 times during the warm season, and from 10 to 14 millions of skins are taken yearly. Many owners of marshes protect muskrats, trap the animals, or lease the trapping privilege and obtain excellent returns from otherwise useless land. Ordinary No. 1 steel traps are used; the skins are cased and cured on stretchers. The fur is prime from December to March and even later.

Other rodents. Ground squirrels, flying squirrels, gophers, wood rats, and some other rodents, while too small to produce desirable furs for market, have pelts that may be utilized to advantage in the home in the various ways suggested in this chapter.

Otter. Otters are still rather common in states along the Atlantic and Gulf coasts and in the Far West, but scarce in many interior sections. The demand for and supply of skins has remained about the same for over a century. They are marketed cased, with the flesh side out and the tail dried flat.

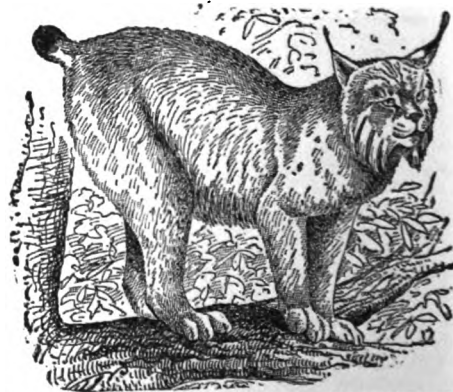


FIG. 592. The lynx is a source of beautiful and valuable fur

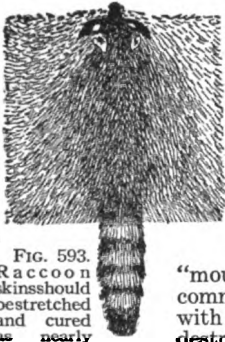


FIG. 593.
Raccoon
skin should
bestretched
and cured
as nearly
square as
possible.

A long stretcher should be used so that the tail may be tacked properly for drying.

Panther. This animal has practically disappeared from most of its range east of the Rocky Mountains. In the Rockies and westward to the Pacific Coast, known as "mountain lion," it is rather common and is regarded with disfavor because it is destructive to live stock and game. Nearly all states in which it commonly occurs offer a bounty for its scalp, but as the skin with scalp attached is valuable for rugs or for mounting, the bounty is not always collected unless it exceeds the skin value. Skins are cured open and, when intended for rugs, with the claws attached.

Rabbit. Skins of the wild, cotton-tail and jack rabbits are thin, easily torn and have practically no fur value. The hair is in slight demand as felting material. Whole raw skins bring one or two cents each. The Northern hares are better and the pure white ones of the Far North have a wide use in fur manufacture. Skins of domestic rabbits are stronger and more durable than those of the wild species, animals of large size and solid colors furnishing the best fur. Breeders of domestic rabbits find the pelts an important addition to their profits, but it would probably not pay to raise them for the fur alone. Skins may be marketed either open or cased.

Raccoon. One of our common and more useful fur animals, ranking third or fourth in total value of pelts marketed. It is protected as a game animal in some states and as a fur animal in others. Skins are marketed open, and should be stretched so as to make them as nearly square as possible.

Skunk. Next to the muskrat, the skunk is the most common and most important fur animal in the United States, over 2,000,000 skins being marketed each year. These are graded as No. 1 (black), No. 2 (short stripe), No. 3 (long narrow stripe), and No. 4 (broad stripe). The first grade has no white markings back of the head, the second no white areas farther back than the middle of the body; the names of the 2 other grades explain themselves. Owing to their large size, the narrow-striped skunks of the Middle West command even better prices than No. 2 pelts. Skins are prime from early November to February, and should be cased. The fur of the little spotted skunk, common southward and in the West, is called in the trade *Civet*. Civet skins are prepared like those of the common skunk.

Squirrel. American squirrel skins are

seldom marketed, but some of them are quite handsome, and, tanned at home, make beautiful trimmings for wearing apparel.

Weasel. The fur of the weasel is of no value except when in the white winter coat. Skins should be cased, then turned fur side out.

Wildcat. The wildcat, bobcat, or bay lynx, ranges through most of the United States but not as far north as does the lynx. Its fur, though shorter and coarser, is much used and finds a ready market. Skins are usually marketed open, but the finer ones would probably fetch better prices if cased.

Wolf. Wolves are now rare in eastern United States, and the larger kinds are gradually disappearing in the West, except the coyote, or prairie wolf, which is quite common west of the Mississippi. Bounties are generally paid for all kinds, either by state or county, but here, too, the removal of the scalp greatly impairs the market value of a pelt. Skins are used for making rugs and coats, collars, cuffs, and even muffs and boas. When used for trimming garments or as fur sets, they are often dyed black. If cased, the pelts should later be turned fur side out. Of late skins have been in good demand, those of the coyote being nearly as valuable as those of the larger gray wolf.

Wolverine. A valuable fur but very scarce in the United States. Skins should be cased.

Woodchuck. Skins of the woodchuck, or ground hog, have almost no fur value, but when tanned with the hair off, supply strong, pliable leather which has many uses on the farm.

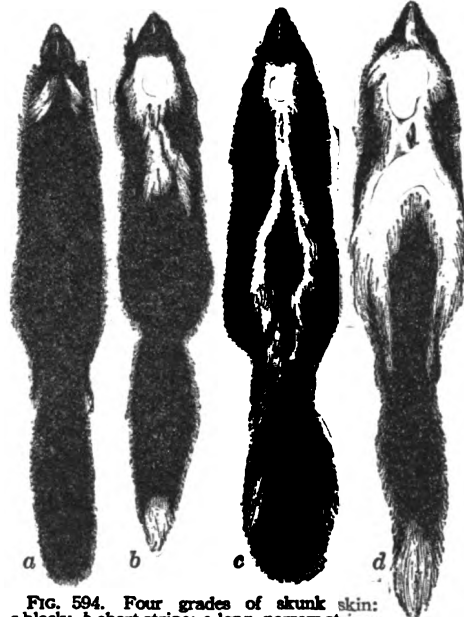


FIG. 594. Four grades of skunk skin:
a black; b short stripe; c long, narrow stripe;
and d broad stripe

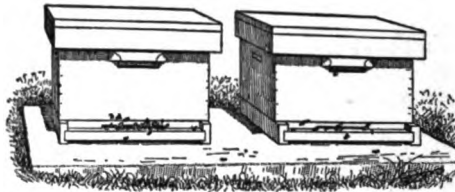


FIG. 596. Two modern hives on a concrete foundation

CHAPTER 49

Beekeeping: Apiary Management

By FRANK C. PELLETT, practical farmer and beekeeper, author of "Productive Beekeeping," and well-known contributor on beekeeping subjects to farm journals. To supplement the experience gained since early boyhood on his father's and his own farms, he has visited many apiaries in all parts of the country and was for some years State Inspector of Apiaries of Iowa. His knowledge of the subject, and the suggestions he makes are, therefore, sound, practical, and time tried.—EDITOR.

WHY keep bees? An *apiary*, strictly speaking, is a place where bees are kept; but more commonly it refers to the place and the hives, bees, tools—in fact the whole outfit used in producing honey. Comparatively few farmers appreciate its possibilities if properly managed. They should bear in mind not only the direct return from the honey crop, but also the fact that the presence of a large number of bees insures better pollination of the blossoms in the vicinity, and consequently much better crops of fruit and other staples. Of course, this latter result can be accomplished as well by a neighbor's bees as by one's own, as they fly several miles from the hives. However, the honey that may be secured from a well managed apiary will bring as good returns for the time and labor expended as the product of any other farm activity. In general, properly managed bees may be expected to return on an average about \$5 per hive each year. There are some localities where bees cannot be profitably kept at all, owing to lack of food plants, severe climate, etc., and others where the return will be much above the average cited. But on the whole in no large section of the United States where farm crops are grown is beekeeping impossible.

The demands of the apiary as to time, labor, and expense are never very exacting. While farm animals and poultry must be fed regularly every day, bees gather their own food and require no care at all for weeks at a time. During winter, when it is often unpleasant to be out, they are quiet and need no care, if properly attended to at other seasons. Since much of the labor involved is light, bees can be cared for by those who are too old or too young for heavy work.

The fact that bees get on well without attention for such long periods, too often results in failure to give them the attention that is necessary, with the result that they do not return satisfactory profits, or die from lack of care. Again, few seem to realize that, although it is possible for those who are not physically fitted for heavy work to make a success with bees, men of good education and perfect health might also profitably give their spare time to beekeeping. In many localities it is a highly specialized business, returning as attractive profits as fruit growing or general farming.

Getting Started with Bees

The simplest way to start is to buy a colony or two, already hived, from some established beekeeper in the neighborhood, but 2 or 3 miles, at least, from the place where you are to keep them. If moved but a short distance the working force will be greatly reduced because many of the bees will return to the former location of the hive and fail to find their way to the new site. The shorter the distance the hive is moved, the greater this confusion and resulting loss.

If bees are not obtainable from a farm apiary within a reasonable distance, they can be bought in any desired amount and at any time from dealers who ship them by express in packages with or without combs. Combless bees must be bought early in the season, so that there will be ample time for them to build combs and store sufficient honey for winter before the close of the season; and hives should be provided in readiness for them with full sheets of "foundation" as described below (p. 519). A simpler but more expensive way to start on a small scale is to buy a full colony in a completely equipped hive (Fig. 598). Or you can order 1, 3, 5 or more hives "in the flat," make them up yourself, and have the desired number of "nuclei" or small colonies of bees on frames of comb follow as soon as you are ready for them.

The extensive honey producer will usually have an investment of about \$10 for each hive of bees, including extra supers or upper stories, honey extractors and other equipment. The small beekeeper will not find it necessary to buy as much to start with, although a reasonable amount of extra equipment is very desirable. Even if you intend to keep but a few colonies for the sake of a home supply, you want to get all the honey possible from them and should have at hand 3, or better, 5 supers for each hive, so as to be ready for the extra-heavy honey flows that come occasionally.

Every beekeeper should have a reference or text book, such as "Productive Beekeeping," or the "A B C and X Y Z of Beekeeping," and would do well to keep in touch with the progress of the industry by means of one of the magazines devoted to it since there are several different systems of management which can be profitably followed.

The Apiary

Site. The first essential in the location of the apiary is a sheltered situation. Protection from wind does more to economize the bees' stores than any other factor controlled by the beekeeper. It is of special importance in early spring when the colony is building up. By this time most of the old bees left over from the previous season will have died and the cluster will be small, but with the coming of the warm days the queen will begin laying rapidly, and brood rearing will be carried on as fast as the ability of the colony will permit. In the event of a sudden drop in temperature the bees may be unable to cover all the brood properly, and some of it may be chilled and destroyed. The better the hive is protected, the easier it is for the bees to maintain the necessary temperature within it, and for the colony to

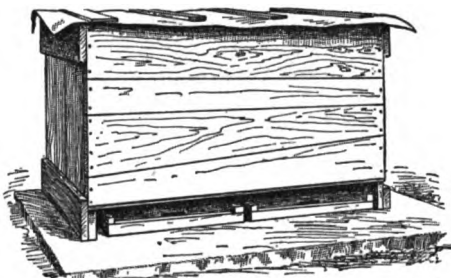


FIG. 596. Hives shown in Fig. 595 protected for winter by means of packing boxes filled with leaves and chaff, and a cover of waterproof building paper.



FIG. 597. A 1-pound package of bees as received from the dealer. (Courtesy A. I. Root Co.)

build up in spring. Also colonies in exposed places suffer much heavier losses and consume much more honey in winter than if protected.

Arrangement. Hives should not be placed close together in rows or a mixing of bees and loss of young queens will result. It is much better to set them in groups of 2 or 4 with 2 facing each way. However, the apiary does not require much space. If it is necessary to place hives near walks or drives, the entrances should face away from them if possible, but it is not generally considered wise to have the hives face north, especially in winter. It is important to secure a gentle strain of bees for such situations.

The hives should be raised off the ground on bricks placed one under each corner, or on some other suitable support. Cement stands large enough for groups of hives are very desirable. The hives remain in position instead of settling to one side or the other in rainy spells, or when the frost is going out of the ground, as often happens otherwise. Hives placed directly on the ground often settle unevenly and rot badly; mice, ants, etc., make nests under them and the grass and weeds growing up in front soon choke the entrance and make it difficult for the bees to get in or out. If blocks or bricks are used, a platform should be provided so that heavily loaded bees that drop to the ground in front may crawl in without again taking to flight. A shingle or other small board leaned against the front of the bottom board will serve.

"Out apiaries." Commercial honey producers in most states find it necessary to divide and distribute their colonies, having, then, the home apiary and one or more out apiaries. There are a few favorable locations where 300 or more colonies may be kept together, but 75 to 100 hives is about the maximum to be profitably kept in a single yard in the average locality. About 3 to 5 miles apart is usually the right distance for out-yards under favorable conditions.

Where beekeeping is carried on in connection with general farming, it is seldom desir-

able to establish out apiaries, although the farmer frequently wants to keep as many colonies as he can profitably manage at home. The writer knows of one general farm of 400 acres well located for beekeeping on which 300 colonies are kept in the orchard behind the house. The bees are allowed to increase by natural swarming and are operated for high class comb honey of which a carload is often produced in a single season, the returns sometimes running as high as \$2,500 or \$3,000. In another case a series of out apiaries is run in connection with a 100-acre farm devoted mostly to dairying and growing alsike clover for seed. In all nearly 1,000 colonies are kept in 7 apiaries, which return on an average more than 50 pounds of surplus honey per hive per year.

Control systems. The system of management to be followed will depend upon the extent of the business, but the average farmer will want to adopt methods requiring the least attention since the bees are only an incident in his business. The honey specialist usually tries to control swarming as far as possible, but when there is only one apiary and this at home, it is not difficult to hive the swarms as they issue and thus save the labor required by any system of swarm control. If the bees increase to a point beyond which it is undesirable to extend the apiary, it is a simple matter to hive the new swarms, and after 2 or 3 days unite them with the parent colonies by setting the old hive (with the bottom removed) on top of the new one (with the top removed). A newspaper should be placed between the two hive-bodies to prevent the bees from fighting as a result of mixing too soon; they will gradually remove it and mingle quietly.

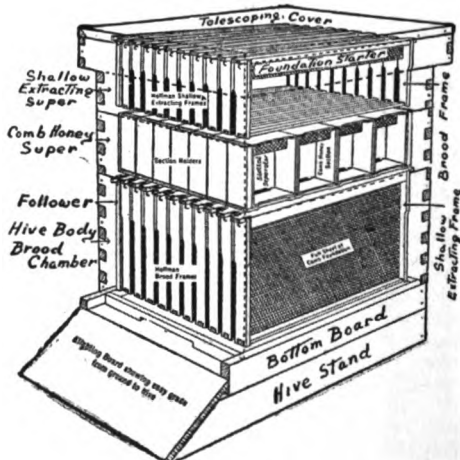


FIG. 598. Diagram of complete modern hive to show all parts. Extracted and comb honey is rarely if ever taken from the same hive at the same time. (Courtesy A. I. Root Co.)

The Beekeeper's Equipment

It is best to start gradually. This may mean with a chance swarm hived in an old box, a single colony taken from its home in the forest, or a hive full bought from a neighbor; or with a complete beginner's outfit purchased from a dealer in bee supplies. While the first cost may appear more, factory made beekeeping goods are generally superior to home made, not because they are hard to make, but because for best results they should be uniform, clean, and attractive. The smaller interior fittings can not possibly be made as well or as cheaply as they can be bought. A typical outfit with its approximate cost is given in the accompanying table, but of course the catalogue of reliable dealers should be consulted for changes, new devices, etc., before an order is made out.

The hive. The modern hive consists of base or bottom board, body or "brood chamber," one or more upper stories or "supers," and a flat or telescoping cover. The *base* is usually fitted with a device by which the entrance can be made large or small according to changes in the weather, etc. The *body* is a topless, bottomless box with a cleat at each end from which hang, side by side, a number of light, wooden "frames," in which the bees build wax comb, in the cells of which eggs are deposited, young bees raised, and food (honey and pollen) stored. The *super* may be a second body or a slightly smaller one in the frames of which surplus honey only is stored. The *frames* may be of regulation size and style (in which case the honey is "extracted" from them and sold clear, the empty combs being replaced in the hive) or may contain smaller wooden boxes or "sections," which are removed intact and sold with their 12 to 16 ounces of "comb honey." The rows of sections are generally kept apart by light wooden "fences," and they, as well as the brood frames, are spaced so as to remain a definite, uniform distance

apart, which varies with the type of hive. Since bees tend to build comb in regular alignment if given a start and an idea where to work, all progressive beekeepers fit into each frame or section a sheet of "foundation" which is pure beeswax rolled very thin and stamped on each side with the impression of

the honey comb cells, and which then becomes the core of the comb built by the bees. The use of good sized sheets of foundation saves considerable time, gives more uniform combs, and stimulates increased honey production. Both to protect and preserve them and to improve their appearance, hives should be well painted, preferably white. For record purpose, it is helpful if not essential to number each hive in large, clear figures.

Fortunately for the would-be beekeeper, the tendency is more and more toward a standard hive. A number of the largest bee-supply houses now list regularly only the standard, dovetailed or Langstroth hive, in two sizes—8-frame and 10-frame.

Special purpose hives. Hives of smaller capacity, such as the Heddon, Danzenbaker, Massie, etc., have been popular and even yet have their champions, who insist that small hives force the bees to place more honey in the supers. But the fact is too often overlooked that a small hive does not provide a prolific queen with sufficient room in which to lay to the limit of her capacity, whereas the larger the working force of bees is, the more honey will be stored. Those who have succeeded with small hives have done so by means of a system in which 2 or more hive bodies are placed one above the other to give the queen more room early, all but one being removed later when the honey-flow begins. This in effect gives a large hive for the production of workers and later reduces its size to force the bees into the supers. Comb honey production by such a system is a skilled operation, at which the novice is quite likely to fail. Swarming is then more difficult to control, and, uncontrolled, is excessive; more labor is necessary; and the close of the season is likely to find the bees without sufficient honey in the brood chamber to carry them over winter. The same condition applies, though to a less extent, to the 8-frame hive, as compared with the 10-frame, which is by far the most popular among successful beekeepers. The writer, after visiting many of the most extensive beekeepers in various states and Canada, feels that it (the 10-frame) is by far the safest hive for the novice

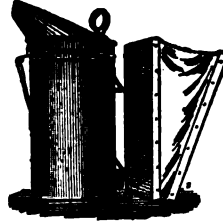


FIG. 600. The smoker is one of the beekeeper's most valuable tools. (Farmers' Bulletin 447.)



FIG. 599. Bee veil; a wire hoop can be worn inside to keep the netting away from the face and give added protection. (Farmers' Bulletin 447.)

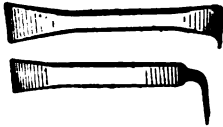


FIG. 601. Two types of hive tool for separating frames, etc. (Farmers Bulletin 447).

to begin with, for either comb or extracted honey production.

For the exclusive, commercial production of extracted honey, even larger hives have certain advantages. The Dadant hive, originated in this country, and now in general use in many parts of Europe, is about 2 inches deeper than the standard (Langstroth) body, and the brood-nest is correspondingly increased. It can accommodate the most vigorous queen, and large colonies are the rule where it is used; also the bees are less inclined to swarm. Many extensive beekeepers are having Langstroth hives made 2 inches deeper than the regular dimensions, for the purpose of getting the advantages of the Dadant hive without requiring entirely new equipment. This adaptability is a decided advantage since if the beginner starts with any other hive and wishes to change his system, much of his equipment will be a dead loss. Small hives like the Danzenbaker are good only for comb honey; the Dadant is best suited to extracted honey production; and it would be difficult to achieve real success with either of them along any other line than that for which it was designed. The beginner who buys the regulation 10-frame hive in standard size will make no mistake.

The smoker. This, next to the bees and the hive, is the most important item of the beekeeper's outfit. It consists of a metal container in which a smudge fire of rags, rotten wood, damp straw, etc., is kept glowing and smoking by means of a bellows, the smoke being used to quiet or repel the bees when working among them. A large one, in which the fire is less likely to burn out at a critical time is to be preferred. Smoke should be used as little as possible, and intelligently; a little drives the bees before it, too much disturbs them and may do more harm than

good. The gentle, golden banded Italians call for but little smoking at any time; the darker bees, so commonly found on farms, are less easily controlled, but a puff at the entrance followed by a few over the tops of the frames as soon as the cover is removed will usually be sufficient.

Protective devices. Practically all beginners will want a veil, at least at first. This may be of any style or material that will keep the bees from the face, neck and hair. A pair of high gloves is also desirable though a thoroughly sting-tight glove is likely to be too cumbersome for entire convenience. The main thing is to close openings in the sleeves, shirt front, trouser legs, etc., into which bees may crawl and where, finding themselves trapped, they may become angry. While a bee sting is uncomfortable and often inconvenient for a few days, it is, to most people, harmless; indeed successive stings usually have less and less effect, so that experienced beekeepers generally work with little or no protection. The use of the veil and gloves is therefore less to actually protect than to give a feeling of security and confidence which makes possible the quiet, slow, unexcitable demeanor that is essential in handling bees. Noisy, hurried, jerky methods and a poorly concealed fear, seem to stir up the anger and resentment of the otherwise docile insects.

Other tools. A good hive tool for prying frames apart, cleaning sections, loosening covers, etc., is a great convenience, although a small chisel or screw driver will answer. Few beginners escape without buying a lot of appliances that for their purposes are largely useless. It is usually wiser to wait and find out what is actually needed.

As the apiary grows, a well arranged honey house and carefully chosen implements for handling the honey crop will enable the beekeeper to get greatly increased results with the least possible labor. The writer would not want to care for more than 50 colonies, run for extracted honey, without a small gasoline engine driven extractor and some improved machine for saving the cappings, or bits of wax cut from the full combs.

The Bee Family

A typical colony of bees includes one *queen* or fully developed female who in a lifetime of 3 or 4 years will lay more than a million eggs; many thousand *workers* or sexually undeveloped females; and, at certain seasons, a varying number of *drones* or males, produced solely that there may be one on hand to mate with the virgin queen whenever one is raised. From early spring until summer, there are also in the hive many *larvae* and *pupae* or immature bees, and eggs from which more are to come.

Normally, only the queen lays eggs, which she fertilizes or not as she chooses, with the male fluid received during her mating flight and stored in a special organ or sac, to be used during her entire egg laying lifetime. An unfertilized egg always develops into a drone; and as he is bigger than a worker, such an egg is al-

ways laid in a special, enlarged cell and covered with a high, domelike cap. A fertilized egg always develops into a worker unless the colony feels or fears the need of a new queen; in this case a worker egg is transferred to a special queen cell (which resembles a small peanut) and the resulting larva is given a special food provided by the attendant bees, under the influence of which it develops into a queen. The time between the laying of the egg and the appearance of the bee is, in the case of a queen, 16 days, in that of a worker, 21 days, in that of a drone, 25 days. In each case 3 days are spent in the egg, about 6 as a larva and the rest as a pupa. Both drone and worker cells are used for storing honey as well as brood rearing; queen cells are torn down as soon as vacated unless in an out of the way corner of a frame. The natural time for them to be built is in early spring, when the number of bees is rapidly increasing and taxing the capacity of the hive. When the new queen is ready to emerge, the old one usually leaves with a large portion of the working force, making what is known as a *swarm*. The young queen thereupon attempts to destroy the remaining young queens still in their sealed cells, and succeeds unless the bees are inclined to throw off a second swarm in which case the workers protect the other queen cells until she has left the hive with the secondary or after swarm. For some unexplainable reason only one queen is permitted to remain in a hive. If she is lost when no eggs or larvae from which to raise another are present, the colony is doomed. The honey bee family, on the whole, is the most perfect social organization known, except, perhaps, the ant community. Everything is done for the good of the family rather than the individual, which, as such, gets little consideration. This, of course, refers to conditions in nature; by careful handling and control man can influence the life of colonies to some extent, and direct their efforts more in line with his own desires and benefits. This is the task of the beekeeper, and one that calls for intelligence, skill, and experience.

Races and types. Of the several well known races, including the Caucasians, Carnolians, Cyprians, etc., the Italians are considered best for American conditions. The German or Black bees were the first introduced to this country and became very generally distributed before the Italians arrived. But they are more ill-tempered than the Italians, poorer honey gatherers, less able to defend their stores against enemies, and more susceptible to disease.

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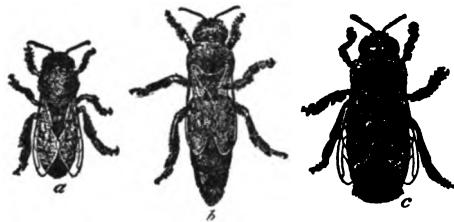


FIG. 602. The 3 members of the bee family. *a* Worker; *b* Queen; *c* drone, slightly larger than natural size. (Farmers' Bulletin 447.)

The Seasonal Care of the Apiary

Beyond receiving a certain, necessary amount of attention, the less the bees are disturbed the better. The life cycle in the hive and the beekeeper's programme are naturally related and may be set down side by side about as on page 522, after which are discussed the various important operations.

Spring care. It should not be necessary to open any particular hive a large number of times in any one season. In spring each should be examined to make sure that it has plenty of stores to last until the beginning of the honey flow—15 pounds to each colony in March is about right. Since at this season brood rearing is at its height in

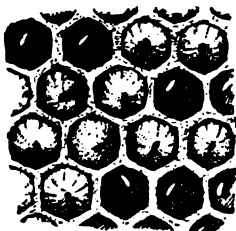


FIG. 603. Section of brood comb (enlarged) showing eggs and larvae (grubs) in the cells.

SEASON	COLONY'S ACTIVITIES	BEEKEEPER'S DUTIES
Winter	Bees dormant except on very mild days when they take short flights.	None, except to see that hives are well protected.
Very early spring	Queen begins to lay eggs. Brood begins to develop. Consumption of stores increases rapidly.	Examine hive. If stores are low, feed (see below). Get new hives ready for swarms, and supers for honey flow.
May and June in the North; earlier in the South	Workers increase tremendously. Drones appear. Queens are reared and when ready, swarms issue, led by old queens. First real honey gathering begins.	Hive swarms as they appear. Combine weak colonies with stronger ones, or supply queens (p. 524). Continue to feed if necessary. Check swarming if desired (p. 524) or increase by division (p. 524).
Summer	Honey gathering and brood rearing continue.	Supply supers just a little faster than needed, and remove sections as soon as filled and capped.
Fall	Brood rearing is checked. Drones are expelled. Honey gathering continues as long as possible.	Cease taking honey in time to let bees store 20 to 30 pounds. Feed weak colonies with sealed combs if possible.
Late fall (before freezing)	All activity gradually stops.	Pack and protect hives for winter or remove to cellar.

preparation for the honey flow, when a large working force will be needed, more honey is being consumed than at any other time during the year. If there is an abundance of stores, brood rearing will proceed rapidly even if rainy weather prevents the bees from flying.

If the bees have plenty of honey the next thing to make sure of is that the colony is not queenless. If the first spring examination discloses eggs and young larvae in the cells, a queen is present and need be looked for no further. If, however, the colony is queenless yet strong enough to justify it, a queen should be provided at once. (There are Southern breeders prepared to supply queens to Northern customers early in the season). If the colony is too weak to be worth the cost of a new queen at once unite it with another (p. 518).

The bees should now need little attention until time to put on the supers, which, with strong colonies, is when the bees are found to be whitening the tops of the combs with new wax. More farmers fail at this point than almost anywhere else, either putting them on long before the bees are ready for them, or waiting until the season is half over. If put on too soon, the bees are unduly taxed by having to warm the extra space; and if left too long, part of the honey crop will be lost. In general, in the clover sections, it is time to put on supers when the white clover blossoms first appear.

Feeding. Good honey is the best feed for bees and it is a good plan to lay aside a sufficient number of full combs in the fall to meet any need the following spring. If the bees are found to be short of stores, if no honey is at hand, and if a

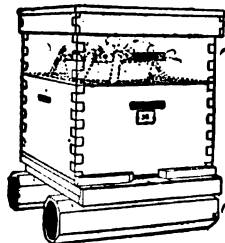


FIG. 604. Method of feeding from a pan placed in an empty super. Note drain tiles used as hive foundation. (Farmers' Bulletin 447).

substitute must be provided, only the best granulated sugar should be used. Glucose or other syrup is likely to have fatal effect. Sugar should be fed as syrup, made as thick as convenient, by mixing equal bulks of sugar and water and heating until the sugar is fully dissolved (but *not* boiling). There are several feeders on the market, but if none is at hand set an empty super on top of the hive and place in it a pan of the syrup. Spread a thin cotton cloth over the pan, letting the edges hang down on all sides. This will enable the bees to climb into the pan and suck up the syrup from the cloth without getting mugged up with, or drowned in the syrup. In doing this, cover the hive as quickly as possible to prevent bees from other hives finding the sweet and starting to rob the colony which is being fed.

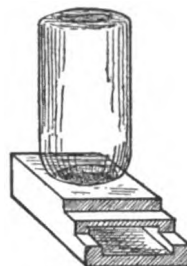


FIG. 605. The entrance feeder consisting of a wooden base carrying an ordinary Mason jar with perforated top.

Hiving swarms. In our grandfathers' day it was the thing, when a swarm was seen, to rush out beating tin pans, ringing bells, making all the noise possible and acting no less excitedly than the bees until they began to cluster on a convenient tree. The theory was that these antics induced the bees to settle, whereas the facts are that 9 times in 10 the swarm will cluster anyway, and that the exceptional swarm will leave without ceremony in spite of all such performances.

When a swarm issues the beekeeper need give it little thought other than to get a hive ready and note where the cluster is forming, where it will probably remain for some hours. After the bees are quiet it is very easy to hive them. If they have settled on a small limb which is easily cut off, it is well to carry the cluster to the newly placed hive and shake it on to a sheet or board in front of it. Usually the bees will run in without trouble, and, if the queen goes in, stay there; but if she gets under the hive or flies away the whole mass will shortly come out again. Sometimes bees will remain quietly in the hive for several hours, then swarm out and leave without clustering again. To prevent this it is a common practice for the beekeeper to remove a frame of unsealed brood from some strong colony and give it to the new swarm which is very unlikely to leave a hive containing brood.

To avoid the occurrence of too many after-swarms, the beekeeper should remove the hive from which the swarm issued to a new position, and in its place put the swarm in the new hive. Most of the field bees will then return to the old location and unite with the new swarm which will become strong enough to store honey rapidly while the parent colony will be so weakened that there will be little danger of its continuing to cast after-swarms. Often when the parent colony is left on the old stand it happens that small swarms continue to issue for several days until both the stock and the after-swarms become almost uselessly small. One strong colony will store as much honey as half a dozen weak ones and after a colony has cast a swarm it will seldom store honey for several weeks; any supers on the hive at this time should be transferred to the hive holding the swarm.



FIG. 606. Swarm of bees removed from a tree and ready to be shaken into an empty hive.

Artificial increase. If a rapid increase is wanted it is not always desirable to wait for natural swarming. While at times the bees will swarm and swarm until there is no surplus honey

stored, at other times they steadfastly refuse to swarm at all. Fortunately the beekeeper can increase his colonies without reference to the swarming tendency. Artificial increasing is best done when the weather is warm and the bees are getting honey from the field. A satisfactory nucleus consists of about 3 frames of sealed brood and the bees clinging to them. Lift these

frames carefully from the hive, taking care *not* to remove the queen with them, and place them in a new hive with its entrance contracted to about 2 inches in width. Then supply them with a ripe queen cell or a young queen and place the hive where it is to remain. If improved stock is desired queens should be ordered in advance to be supplied at this time. Each queen comes in a small



FIG. 607. How to hold and clip the wings of a queen bee to prevent her escaping with a swarm

cage which is placed in the hive after the piece of pasteboard that covers the end is removed. This discloses an opening filled with candy which must be eaten away by the bees before the queen can get out. By the time the bees have eaten the candy they will have become accustomed to her and are likely to receive her kindly.

Rearing queens. If the beekeeper wishes to rear queens from his own stock, he should

select his best colony as the source of the breeding stock and another strong one to build the cells. The first thing to do is to take a partly built comb, if there be one, or if not a frame with a full sheet of foundation and place it in the middle of the best colony, in place of another comb which is removed. Two or three days later, if conditions are favorable this new comb should be filled with eggs. The strong colony which is to build the queen cells is then deprived of its queen and the new comb full of eggs laid by the best queen (who must be left in her hive) is placed in the middle of the queenless colony. This furnishes natural conditions for building queen cells and usually in the effort of the queenless colony to provide itself with a new queen several will be built at once. Ten days later these queen cells will be sealed and one can be given to each three-frame nucleus as already described. The queen cell should be cut away very carefully so as not to injure the young queen and may be fastened to the centre of the middle comb by cutting a small depression in the comb or simply by sticking it on with a toothpick. The young queen will emerge from the cell in the hive where she is to remain and within a few days will be laying.

When the queen is from 5 to 7 days old she usually takes her mating flight. The mating takes place on the wing, and one meeting with the drone is sufficient to fertilize her eggs for life. After the return from the mating flight the queen seldom, if ever, leaves the hive except to go with a swarm.

Bee Diseases and Enemies

The waxworm. This, the grub or larvae of the *waxmoth* is the thing most dreaded by the novice. However, the expert beekeeper pays very little attention to moths for if other conditions are right there will be little trouble from them. When a colony becomes queenless and dwindles down as a result, or is weakened by disease, or for any other reason is no longer properly able to defend its hive, the waxmoth enters and lays her eggs and the larvae are soon destroying the combs. The novice finding this condition naturally supposes that the colony has been destroyed by moths, when the truth is that the moths came in after the colony was suffering from other troubles. Strong colonies are able to defend themselves from moths, but empty combs must be cared for or they will be destroyed. The safest place for empty combs in summer is over a strong colony of bees.

Foul-brood is really the most serious difficulty which the beekeeper is likely to be called upon to meet. There are two forms of this disease, known as American and European foul-brood. As the name indicates, the disease affects the brood in the larval stages.

While the expert will readily distinguish between the two forms, the novice finds the descriptions of their symptoms very confusing. In both diseases the larvae die in the cells, but with European foul-brood they die at an earlier stage than with American foul-brood. With the European foul-brood queen and drone larvae are affected in a similar manner to worker larvae, while with the other form queen and drone larvae are seldom affected. The most common method of distinguishing between the two forms is to insert a small stick such as a match or toothpick into the dead tissue and withdraw it slowly. If it seems ropy and stretches out for a distance before it breaks, American foul-brood is probably present.

It is highly important that either disease be discovered early in order that it may be treated before the entire apiary becomes affected. The annual losses from these diseases are very heavy and the writer has known beekeepers whose losses reached thousands of dollars because the disease was not discovered until it had spread widely. It is always wise for the beekeeper when opening the hive

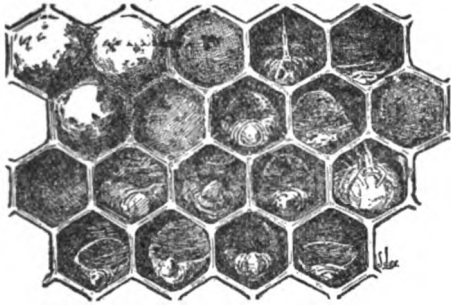


FIG. 608. Section of comb showing signs of American foul brood. The three cells in the upper lefthand corner are normal. The two next to them show sunken cappings, indicating the presence of disease. Other cells show grubs in different stages of destruction. (Farmers' Bulletin 442).

for any purpose to take a look at the brood. If dead brood is found it is an easy matter to cut out a portion of the comb containing

it, and mail to the Bureau of Entomology of the U. S. Department of Agriculture, at Washington. An expert examination will be made without charge and the beekeeper will be advised at once of the nature of the trouble and what should be done.

When American foul brood is found to be present the bees may be saved by removing to a new, clean hive without brood or honey. The old combs including brood and honey must be entirely destroyed, since it is impossible to eradicate the disease from the combs

so that they can be used again. The combs may be melted up and the wax saved. The honey can be saved also if worth while, but should never be fed back to the bees since the disease is usually spread in the honey.



FIG. 609. The ropiness of American foul brood. (Farmers' Bulletin 442).

back to the bees since the disease is usually spread in the honey.

Wintering Bees

The simplest way to winter except in the Far North is to use the double walled or chaff hive. This can be had in the standard 10-frame size already discussed and in view of the fact that it makes unnecessary the placing of the hives in the cellar and taking them out, or the packing involved in any other plan, the time and trouble it saves will more than justify its slight extra cost. It is especially suited to the needs of the man who only expects to keep a few bees and who does not wish to have them constantly on his mind. With the double walled hive, when the honey is removed in the fall, all that remains is to make sure that the bees have plenty of stores and a queen, and that the colony is strong enough to winter. A bag of leaves is then placed under the big cover, the entrance is contracted and the job is done.

If the bees are wintered in the cellar they should not be left out too late, nor taken out too early in spring. The cellar should be dark, warm, and dry. Bees do not winter well in a cellar where the temperature falls to freezing, or where it rises and falls according

to temperature outside. An even temperature of about 50 degrees is desirable; if it rises much higher the bees become uneasy.

Bees winter well on the summer stands if properly protected. A very good plan is to use a packing case which leaves the entrance open so that they can fly on warm days. About 6 inches of leaves or chaff should be packed all round the hive and more over the top. The cover to the case should be tight or some sort of roofing paper should be spread over it so that the packing cannot get wet. Large goods boxes can usually be had for a trifle at many stores and make good packing cases.

The novice very frequently moves the bees into some kind of building where the temperature rises and falls with the outside changes. The bees are likely to be worse off than if left unprotected on their stands, for when warm days come they generally leave the hive and many of them fail to find their way back again. The building in such a case is little more than a windbreak, and protection like that just described is far better.

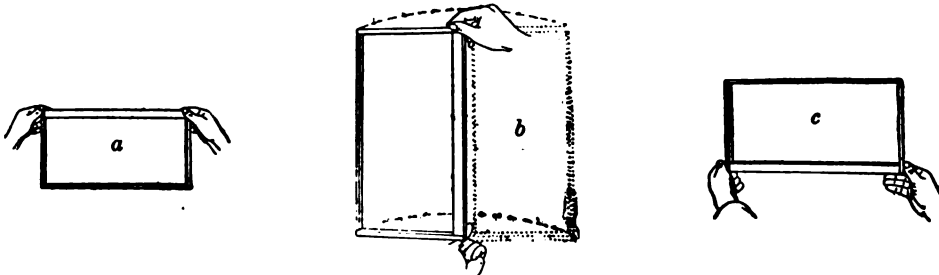


FIG. 610. How to handle a frame so as to view both sides without breaking the comb or losing honey: a First position; b second position in which frame is swung like a door; c third position. Return to original position in reverse order.

CHAPTER 50

Honey Production

By FRANK C. PELLETT (See Chapter 49). *No phase of farming can be taught solely through books; beekeeping especially requires actual work with hives and bees, careful observation, prompt action, and, most of all the sympathetic interest in the insects and their work that characterizes every successful beekeeper. Not until he puts on his veil and gloves, takes his smoker and makes his way into the busy centre of the bee community can any one expect to really learn the subject. If he is fitted for it and enjoys it, he will learn rapidly, and as rapidly profit thereby; if he loses interest or finds the work distasteful, nerve racking, monotonous, it is a case of a square peg in a round hole—the sooner he sells or gives his bees to some one else, the better, and the less he will lose by the venture. The best beekeeper is born; a good one can be made, but never against his will or inclinations.—EDITOR.*

HONEY—Its nature, value, and use. Honey is the nectar of flowers, gathered by the bees and elaborated by them into the finest sweet product known. A chemical change takes place in the honey-sac of the bee which converts the thin, watery nectar into a thick syrup which does not spoil readily. During the process of ripening the honey is moved from place to place in the hive several times. The bees also keep up a continual air current, by fanning their wings, to assist in evaporating the excess of moisture.

Well ripened honey is a very desirable addition to the housewife's stores. It is always ready for use, and if kept in a warm, dry place, may be used to-day, to-morrow, next week or five years hence as it will not spoil. When the time needed for, and the cost of, preparing most food products for use is taken into consideration, together with cost of fuel, honey will be found to be one of the cheapest as well as one of the best food products to be had. It should not be kept in a damp cellar or the ice box, where it gathers moisture and gradually loses quality, comb honey becoming "weepy" and in time spoiled, and extracted honey getting thin and watery. A shelf back of the stove or in the pantry or other dry place is best. Honey is not injured by dry cold except that frequent changes of temperature will cause it to candy or granulate. Extracted honey is not injured by granulation as it can readily be restored to the liquid state by placing the jar or pail containing it in hot water (take care not to overheat it and thus spoil the flavor). Granulated comb honey cannot readily be restored, as sufficient heat to bring

about the desired result would melt the wax of which the comb is composed. As far as food value goes, granulated honey is just as good as any other, though the average person does not care as much for it.

Honey is a most healthful sweet. Dr. J. H. Kellogg, the well known diet authority, says: "Cane-sugar should be eaten only in small quantity. Large quantities cause acidity and give rise to gastric catarrh and indigestion. Sweet fruits such as raisins and figs, honey and maltose or malt sugar are natural and wholesome sweets and may be eaten freely." While some authorities question this difference in digestibility and value of different kinds of sugar, it is generally agreed that honey is a wholesome and thoroughly desirable article of food. Dr. C. C. Miller, an Illinois physician past 85 years of age, says that he eats honey instead of sugar because he wants to live as long as he can and be as well as he can while he lives, and also that: "It would be greatly for the health of the present generation if honey could be at least partially restored to its former place as a common article of diet."

Comb Honey Production

Comb honey in pound sections, until very recently, has always been in greater demand than extracted honey and at much better prices. Because the product in this form could not be successfully imitated the buyer felt safer in insisting on the comb honey. Lately, however, the pure food laws have given the public

more confidence in the purity of the extracted article and the difference in price becomes less every year. But it costs more to produce a nice grade of comb honey and it is seldom possible to secure as large a yield, so the beekeeper must get a larger price to make its production profitable. The average novice prefers to produce comb honey (although he would probably secure a large net return from extracted honey) because, first, the equipment needed is not extensive or costly, and, second, although maximum results call for considerable skill, it is not difficult to get a moderate return.

Handling supers. It is a too common practice to place a single comb honey super on the hive and wait until it is filled before replacing it with another. This is a serious mistake for a strong colony will often store as rapidly in each of 2 or 3 supers as in one alone. As soon as the combs in the brood chamber begin to show white with new wax, place the first super on the hive. As soon as the bees have begun to work in half or more of the sections place a second super on top; they should never be crowded for room in the supers. The old idea that bees are preparing to swarm when hanging in bunches on the front of the hive is based on the facts that the bees often will swarm when crowded for room, and that big bunches of bees hanging out during the middle of the day indicate that there is either insufficient ventilation, or insufficient room for them to work. Neither condition should be tolerated; the entrance of the hive can be enlarged or the hive body set up on little wedges to give more air in hot weather, and more supers can always be provided to accommodate the working force. One should never wait until this loafing outside becomes general, as it is then hard to get the bees working normally again until after swarming. During a heavy honey-flow they will often occupy 3 or 4 and possibly 5 or 6 comb honey supers at one time. Even if not used at all supers in place can do no harm during the honey-flow, and furnish good insurance against a loss of honey. The novice should always add empty supers *on top*; if placed under partly filled ones there may be many partly filled sections left at the end of the season.

Foundation starters. Another mistake often made is to use very small sheets of foundation or "starters" in the section. If a starter only an inch or so wide is used but few bees can work at one time, while if one the full width of the section and at least half its depth is used the whole section can be occupied at once. The cost of the extra foundation will be returned from 10 to 20 times over in the increased amount of honey stored in a good season as a result of its use. In a poor season the bees are very slow to work in supers anyway and any additional help is important. It is always a good plan to save any partly built sections at the end of the season and place one or two near the centre of each super; they will do much toward getting the bees started to work above the broodnest.

Extracted Honey

The strained honey of our grandfathers' day was a very different product from the extracted honey now shipped to market by the carload. The old method of

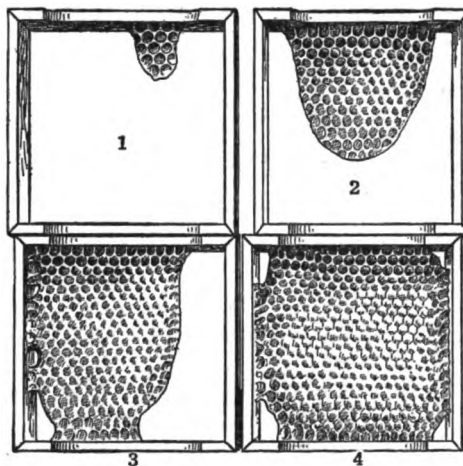


FIG. 611. Four stages in the building of honey comb in a section



FIG. 612. Honey extractor cut open to show wire frames in which uncapped comb is placed and revolved so that the honey is thrown out.



FIG. 613. Uncapping knife

obtaining it consisted of cutting out the combs, mashing them up, and hanging up the mass in a cotton cloth to drain. This was very slow, mussy and much of the honey was wasted. The up-to-date beekeeper removes the clean combs from the hive, shaves off the cappings with a hot knife and throws the honey from the combs out against the sides of the extractor by revolving them rapidly in a frame or basket inside the machine, from which the honey is later drawn out through a faucet at the bottom. The uninjured combs are then returned to the bees to be filled again. This saves the bees the labor of building new combs and enables them to store much more honey than would be possible otherwise. This is the principal reason why extracted honey can be produced cheaper than comb honey. A colony of bees that will store 50 pounds of comb

honey will often store 70 to 100 pounds of extracted honey in the same time and under the same conditions.

Value of strong colonies. The one big factor in getting a crop of honey, next to favorable conditions controlling nectar secretion in flowers, is *big colonies of bees*. The whole year's work in the apiary should be planned with the end in view of bringing every colony to the beginning of the honey-flow with a multitude of young bees ready to gather the harvest. Young queens, sheltered situations, good wintering and plenty of stores for early brood rearing all help to this end.

Honey should not be removed from the hive until properly ripened. Green honey sours readily and not only finds slow sale but spoils the market for good honey. Enough supers should be provided so that the beekeeper can leave the honey in the hive until four fifths of the cells are capped; it is even better if all are capped before it is removed.

Marketing and prices. One great drawback to the business of beekeeping is the tendency of the small producer to sell his product at prices far below market quotations. The man with a small amount to sell does not give the price much consideration and sells at any figure which comes to mind. His customers, after such a local supply is exhausted, expecting to buy at the store at a similar price, complain bitterly or refuse to use honey because they cannot buy it at the store as cheaply as from their neighbor. Beekeepers have recently (1916) retailed fancy comb honey at \$3 per case at a time when grocers buying through regular channels were paying \$4.80 per case wholesale. After adding a reasonable profit for handling, dealers are compelled to ask nearly double the price for which the amateur producers sell their crops. A case recently came to the writer's attention of a well-known beekeeper advertising to supply his neighbors the best white clover honey extracted at 10 cents per pound in any quantity. At the same time a large bottling concern was offering 10½ cents per pound for the same kind of honey in carlots. After adding freight charges, commissions, packages, labels, cost of packing, etc., the bottling concern could not sell at a price that would enable the grocery trade to retail the honey at less than 20 cents per pound. It would seem that a man who has honey for sale should have sufficient regard for the stability of the business and sufficient self-interest to demand a reasonable price. The farmer who would peddle his corn crop about town at 30 cents per bushel when it would bring 40 cents by the carload, would be no more foolish than many small honey producers actually are, who sell at retail for less than they could get at wholesale, if they only took the trouble to study market prices and demands.

By-products of the Apiary

Saving and using wax. Beeswax is a by-product, but it brings more money per pound than does the honey. Good wax of a light color is usually worth from 30 to 35 cents per pound wholesale, so it stands the beekeeper in hand to take care of even small quantities of it. All bits of comb, scrapings and cappings, should be thrown into a "sun extractor" which is an inexpensive device for melting up empty combs, scraps, etc., and which should be a part of the equipment of even a small apiary. If the wax is thrown into a box or other receptacle without being melted, the waxmoths will shortly destroy a large portion of it. If the beekeeper once forms the habit of carrying a bucket or other convenient vessel about with him and dropping every bit of refuse wax that he would otherwise cast aside, into it, and, at the end of the day, throwing it all into the solar extractor, he will save it all with little trouble. The sun will melt the comb and most of the wax will run into the mold at the bottom of the pan. However, the "slumgum" or refuse still remaining contains considerable wax and should also be saved, and at the end of the season sent along with the wax to the market. Most manufacturers of comb foundation will render such refuse for a small consideration, and either pay cash for it or work it into the foundation for the beekeeper.

Beeswax is put to many commercial uses, being an ingredient of many kinds of varnish, furniture polish, lithographic inks, etc., besides a number of commodities handled by druggists. However, the beekeeper is his own best customer and should usually have all his wax rendered into foundation for his own use.

"Bee bread" and propolis. These are hardly by-products, since the beekeeper makes no use of them, but being important features in every hive they deserve mention. Bee bread is simply pollen gathered by bees in their search for honey, packed into "baskets" on

their hind legs, carried to the hive and stored in cells, until wanted for use as food, especially for young bees. The beekeeper cannot mistake the *uncapped* cells containing the yellowish, powdery substance. Fortunately it is rarely stored outside the brood frames.

Propolis or bee glue is a varnish-like cement collected by the bees from resinous buds and



FIG. 614. Removing full supers in comb honey production. Note the bee escape board which permits the bees to leave the super that is to be removed but prevents them from coming back into it.

other plant sources and used for sealing up all cracks and openings inside the hive. The smallest space between frames, section boxes, hive and cover, etc., is quickly filled with this sticky, brownish material which becomes brittle in cool weather. Presumably the bees' desire is to make their hive absolutely tight against the coming of cold weather; by seeing that all parts fit well and meet snugly, the beekeeper can assist them to this end and also save himself the trouble and mess of scraping and cutting away the propolis every time he opens a hive.

The More Important Honey Plants

White clover is the most widely distributed of the important honey plants and *alsike clover* is to be found over much of the same territory. The clover region in general may be said to extend from the Missouri River east to the Atlantic Ocean and to include the Eastern Canadian Provinces. South of the Ohio River the clovers are less important, although they are the source of some honey as far south as Georgia. Clover honey is of the finest quality and because of the wide distribution of the plant it is well known in the markets and always commands the highest price. In the Great Lakes region *buckwheat* is an important source of nectar, though the honey from this source is dark and strong.

In the southeastern states the principal

honey sources are trees, *basswood*, *sourwood*, *locust*, *yellowwood*, and *tuliptree* being among the best known. In Florida, also, most honey comes from trees, but of quite a different kind. The *citrus* trees are important as are also such wild trees as the *tupelo*, *mangrove*, and *palmetto*. In the cotton belt, *cotton* is an important honey plant as well as *horsemint*, *gallberry*, and *partridge pea*.

In Texas, Arizona, and New Mexico *alfalfa* is important in the irrigated sections, while *catclaw*, *prickly pear*, and *mesquite* are typical desert honey plants. In irrigated sections of Idaho, Colorado, and Utah, *alfalfa* is the principal honey plant with *sweet clover* a close second. Sweet clover is also very widely distributed over a large portion of

the country east of the Rocky Mountains and its range is constantly being extended, so that it bids fair shortly to be the most widely grown of any important honey producing plant. In California the *sages* are important as are the various species of *eucalyptus* or gums, *blue thistle*, *tarweed*, *beans*, *alfalfa* and many others.

Some plants supply nectar but no pollen; others pollen but no nectar; and some both pollen and nectar. Pollen is gathered from corn for instance, but no honey comes from this source. In many localities the willows furnish the season's first supply of both honey and pollen. In the northeastern states, the honey season opens in early spring with the blooming of the maples and willows, followed shortly by the first fruit trees. By the time these have dropped their petals the dandelions will be coming into full bloom, and where abundant, are highly valuable to the beekeeper, furnishing both nectar and pollen at a time when other sources are scarce. After the dandelions begin to fade, there is only a brief pause until the white clover blossoms appear. In localities where there is a long summer—heartsease and Spanish needle

following the clovers—the bees have a long gathering season and there is seldom an entire failure of the honey crop.

Beekeepers have long dreamed of sowing special honey crops that would enable them to keep large numbers of bees in one place and thus make big profits. Thus far there is little to indicate that any special plant will ever be profitable for honey alone; too much land is required to supply sufficient bee forage, to make this practicable. If one lives fairly near a large acreage of white clover pasture, or alsike grown for seed, or any other good source of nectar grown for other purposes so much the better. When it is remembered that bees fly from 1 to 4 miles in each direction from the hive it will be seen that they cover a pretty big territory. It often happens that there will be a sufficient support for a small apiary where a larger one would be unprofitable. The subject of overstocking is one that has puzzled beekeepers not a little and the number of colonies that can profitably be supported in any given locality can only be determined by gradually increasing the number until it is seen that the forage is no longer sufficient for best results.

The Beekeeping Industry of America

There was a time when a few bees were to be found on almost every farm. Cane sugar as now used was practically unknown and the bees furnished the family supply of sweets. This is no longer true and but comparatively few farmers keep bees, the number growing less every year while the number of beekeeping specialists is increasing. This change has come about partly because of the generally changed conditions under which the farmer no longer tries to produce everything he needs and uses at home; and partly because of the spread of disease among bees. The indifferent and careless no longer find it profitable to keep a few colonies in boxes under the apple trees; bees will no more thrive and give satisfactory returns under adverse conditions, than will a neglected garden or uncared for livestock. The essentials necessary to their care are not difficult to learn nor is a large amount of time required, yet bees are disappearing from the American farm. The census of 1900 listed 707,000 farms where bees were kept in the United States; in 1910 the number had dropped to 586,000.

While this suggests that bee culture is on the wane, the fact of the matter is that the opposite is true. For while many a farmer no longer keeps a few colonies as his grandfather did, the business is becoming more specialized every year and there are to-day many men who number their colonies by hundreds and even thousands. While the census figures show a great falling off in the number of farms keeping bees, they also show an increase in *total value of bees reported*. The concentration of the business in the hands of specialists favors better beekeeping and larger honey production.

Since the census report includes only bees found on farms it fails to furnish satisfactory information regarding the extent of the business as a whole. A large proportion of the extensive beekeepers of the country live in towns and rent apiary sites within driving distance. It is quite probable, therefore, that the recent census reports do not cover more than 50 to 75 per cent of the bees of the country and considerably less of the yields and values of honey and wax. The

\$6,000,000 given as the total value of honey and wax for 1909 can hardly represent more than half of the actual amount harvested. The business of the large concerns engaged in selling beekeeping supplies indicates a much larger production. It must not be forgotten that for the most part only the smaller apiaries are owned by farmers and consequently reported in the census pages.

Beekeeping is largely specialized in certain localities; in parts of California and Texas it is a leading industry. According to census figures based on the value of the product rather than the quantity of the output, the leading beekeeping states in order of their importance are: California, New York, Texas, Michigan, Iowa, Missouri, and Pennsylvania. North Dakota, at the bottom of the list reports a total of only about 500 colonies on farms; Texas, on the other hand, reports 238,000 colonies on the farms of that state.

In almost every state there are plenty of suitable locations for profitable beekeeping, either as a side line on the general farm or as a specialty. There is probably no more favorable opportunity in the field of agriculture, considering the amount of capital required, than is offered to the man who will specialize in the business of honey production.

BEEES ON FARMS IN 1900 AND 1910

SECTION	NUMBER OF COLONIES		VALUE OF COLONIES		PER CENT OF TOTAL COLONIES		AVERAGE VALUE PER COLONY	
	1900	1910	1900	1910	1900	1910	1900	1910
New England	50,713	40,627	\$ 206,151	\$ 195,959	1.2	1.2	\$4.07	\$4.82
Middle Atlantic....	362,996	291,659	1,164,581	1,166,587	8.8	8.5	3.21	4.00
East North Central.	654,979	545,938	1,897,163	1,800,931	15.9	15.8	2.90	3.30
West North Central	532,877	546,693	1,608,512	1,729,683	13.0	15.9	3.02	3.16
South Atlantic	854,909	678,439	1,664,636	1,574,577	20.8	19.7	1.95	2.32
East South Central.	730,234	506,962	1,459,835	1,117,145	17.8	14.7	2.00	2.20
West South Central.	559,150	379,842	1,053,562	997,825	13.6	11.0	1.88	2.63
Mountain	146,482	172,654	492,539	784,056	3.6	5.0	3.36	4.54
Pacific	215,899	282,192	631,108	1,006,582	5.6	8.2	2.92	3.57
United States	4,108,239	3,455,006	\$10,178,087	\$10,373,615	100.0	100.0	\$2.48	\$3.01

INDEX OF SUBJECTS

Abbreviations used in drugs and doses, 366

Abscess, Opening an, 384

Absorbent liniment, 371

Absorbing ointment, 371

Acetanilid, 367

Acetic acid, 367

Aconite, 367

Albumen, 435

Alcohol, 367

Aloes, Barbadoes, 367

Alum, 367

Ammonia, Aromatic Spirits of, 367

Common solution of, 367

Animal bodies, how constructed, 262

body, Organs in, 262

diseases, Recognizing, 261

How to care for injured, 374

insensible, Rendering, 376

products, 433

Animals, farm, Surgical treatment of, 374

Game and fur, profitable, 165

Handling, previous to slaughter, 485

Slaughter only healthy, 482

originally wild, All, 165

Wild, may be domesticated, 165

Raising on farm, 165

Anodyne liniment, 371

Apothecaries' weights, 361

Anthrax, 424, 428

Cause of, 428

fatal to man, 428

germs, How, carried, 429

serum should be used by experts, 430

should be reported at once, 429

Symptoms of, 428

Treatment and prevention, 429

Vaccination for, 429

victims should be burned, 429

what it is, 428

Antimony, 367

Apomorphin hydrochlorate, 367

Apothecaries' liquid measure, 361

Aqua fortis, 369

Areca nut, 367

Arecoline hydrobromide, 367

Arnica, 367

Arsenic; Fowler's Solution, 367

White, 367

Arsenious acid, 367

Asafetida, 367

Ash in milk, 436

Atropin sulphate, 367

Babcock test, 443

for skimmilk and buttermilk, 444

Bacon strip, Cutting, 498

Baking soda, 370

Bantams, Ornamental, 212

Bascos as sheep herders, 101

Bass, Black, Rearing pond for, 179

Beavers difficult to breed, 172

Beef, Baby, management, 65

Calendar of management, 65

Popularity of, 62

production, 62

Bleeding, 486

breeds, Average weights of, 75

carcass, Quartering, 487

Raising the, 487

carcasses, Cutting, 487

cattle, Breeding purebred, 67

Marketing, 66

Profit in, 59

Chuck ribs of, 488

Corned, 498

Cross ribs of, 488

cuts and prices, 484

Dried, 498

Flank, 488

Forequarter cuts of, 488

herd management, 63, 65

hide, Folding, 487

Hind quarter cuts, 488

Kidney fat, 488

killing, Handling before, 486

Loin, 489

Neck of, 488

Plate of, 488

Porterhouse steak, 489

Prime ribs of, 488

produced on farm, 59

on range, 59

production in America, 67, 591

in feed lot, 60

rings, Coöperative, 495

Round, 489

Rump, 489

Shank, 488, 489

Shoulder of, 488

Skinning, body, 487

forelegs, 486

head, 486

hindlegs, 486

Slaughtering, 486

Splitting, carcass, 487

Stunning, 486

viscera, Removing, 487

Belladonna; deadly nightshade, 367

Benzoin, 367

Birth, abnormal, How to assist, 384

Bismuth paste, 371

Subnitrate, 367

Bison, American, 167

Black hawk, 367

- Blackleg, Cause of, 430
 - Disinfecting for, 431
 - victims should be burned, 431
 - What to do against, 431
 - it is, 430
- Blister beetle, 368
- Blister I, 371
- Blister II, absorbent, 371
- Blister III, liquid, 371
- Blood, Products made from, 501
- Blue ointment, 369
- Blue stone, 368
- Boar, Age of breeding, 134
 - Choosing the herd, 134
 - Disinfecting purchased, 134
 - First service of, 135
 - Importance of exercise, 135
- Boars, Age for service, 136
 - Castration of, 379
- Bones, Uses for, 501
- Boracic (boric) acid, 368
- Brains, Handling, for food, 502
- Breeding, Artificial, 16
- Broilers, When to sell, 194
- Brooder, Coal-burning, 202
- Gasolene-burning, 202
- Brooders, hot water, heated by, 202
 - Individual-lamp, 202
 - Many kinds of, 192
 - Types of, 202
- Brooding, Artificial, 192
 - chicks, 201
- Brown Swiss cattle, 71
- Buchu, 368
- Bull, Care of, 55, 64
 - Choosing the, 53
 - Importance of purebred, 63
 - Ringing the, 382
 - Castrating the, 379
- Bulls, Demand for purebred, 67
- Butchering, By-products of, 500, 501
 - Equipment for, 484
 - Farm, 484
- Butter, Churning, 468
 - Composition of, 472
 - Creamery, Cost of making, 472
 - Manufacturing, 472
 - Contents of, 440
 - How to make farm, 467
 - tell from oleomargarine, 436
 - packages, Preferred, 473
 - Packing, 468
 - Preparing market, 470
 - production in U. S., 466
 - Salting, 468
 - Size of print, 473
 - Storing, for home use, 471
 - Unsalted, 469
 - Washing, 468
 - Why colored, 468
 - Working, 468
- Buttermaking, Creamery, 471
 - on farms and in factories, 466
- Buttermilk, Contents of, 440
- Calf, Cost of raising, 63
 - lice on, Killing, 63
 - scours, 56
 - stomachs for cheese making, 501
- Calomel, Mild mercurious chloride, 368
- Calves's navels, Disinfecting, 396
- Calves, Chemical dehorning of, 381
 - Killing, 494
 - Purebred, Feeding and fitting, 67
 - Raising, 55
 - vs. buying feeders, 61
 - Show, Fitting for, 68
 - Skinning, 494
 - Teaching, to lead, 68
 - viscera, Removing, 494
- Camphor, Gum, 368
- Cannabis Indica, 368
- Cantharides, 368
- Capsicum, 368
- Carbolic acid, phenol crystals, 368
- Carp culture, 179
 - Demand for, 176
- Casein, 435
 - Hart, test, 445
 - Value of, 441
- Cascara sagrada, 368
- Castor oil, 368
- Castrated colt, After treatment of, 378
- Castration, Advantages of, 377
 - Bleeding after, 378
 - Blood poisoning after, 378
 - Hints on, 377
 - Lockjaw after, 378
 - of Ridglings, 380
 - ruptured animals, 380
 - Swelling of sheath after, 378
 - Tumor of cord after, 378
 - Water seed after, 379
- Catalo, How produced, 167
- Catechu, 368
- Catheterization, 386
- Catheter, Passing the, 386
- Cattle, Aberdeen Angus, 76
 - Ayrshire, 80
 - Beef, 75
 - Conformation of, 76
 - Early maturity important, 76
 - Weights of breeds, 75
 - Brown Swiss, 71, 81
 - Carcass, Value of, 483
 - dairy, Increase of, 83
 - Dehorning, 381
 - Dexter, 72, 83
 - Dual purpose, 69
 - breeds, 70
 - in America, 70
 - Increased demand for, 69
 - in Europe, 70
 - Profit in, 70
 - Dutch Belted, 81
 - Exports, Decline in, 87
 - Fattening, on pasture, 65
 - French-Canadian, 81
 - Galloway, 76
 - Guernsey, 81
 - Hereford, 76
 - Holstein-Friesian, 82
 - Imports of, 87
 - industry of U. S., 83
 - in 10 leading states, 87
 - U. S., 84
 - Jersey, 82
 - Kerry, 83

- Cattle, markets in U. S., 87
 - Polled Durham, 78
 - production, Decline in, 87
 - purebred, Importance of, 75
 - Red Lincolnshire, 70, 72
 - Red Poll, 71
 - producing countries, Important, 89
 - regions, 88
 - Shorthorn, 78
 - South Devon, 72
 - Sussex, 79
 - Texas (Longhorn), 79
 - Two great groups of, 83
 - Types and breeds of, 74, 77
 - West Highland, 79
 - Union Stock Yards, 87
 - Value of, to man, 74
 - Why dehorn, 381
 - with hogs, 64
 - Young vs. old, 62
- Cavies, 168
- Breeding, 169
- Cavy, Abyssinian, 169
 - Dutch-marked English, 169
 - Peruvian, 169
- Cayenne pepper, 368
- Charbon, 428
- Charcoal, Wood, 368
- Cheese, Amount of milk for, 476
 - Brick, 477
 - Buttermilk, 475
 - Camembert, 478
 - Cheddar, 475
 - made, Where, 476
 - Making on farm, 476
 - Commercial varieties of, 476
 - Coöperative selling, 479
 - Coloring, 477
 - Cost of making, 479
 - Curing, Time of, 477
 - at low temperature, 477
 - Edam, 478
 - factory, 47
 - How many cows for, 479
 - management by farmers, 478
 - Insuring coöperation in, 479
 - Organizing a new, 479
 - vs. creamery, 478
 - Fat test method of buying milk, 481
 - Head, 500
 - How many kinds of, 476
 - How to test, 444
 - in America, When first made, 478
 - industry should be developed, 447
 - Limburger, 477
 - Methods of selling, 480
 - Milk of different animals for, 476
 - Moisture in, 477
 - Neufchatel, 475
 - on farm, How to make, 474
 - Parmesan, 478
 - Pimento, 475
 - Producers' federation, 480
 - Roquefort, 477
 - Sage, 477
 - Sizes of, 477,
 - Skim milk cottage, 474
 - for, 476
 - Swiss, 477
- Cheese, Testing milk for, 481
 - What it is, 440
 - White, for special trade, 477
- Cheesemaking, Advantages of, 478
 - in factories, 478
 - on farms, 474
- Chicks, brooder, Rations for, 201
 - Brooding, 201
 - Care of, 201
 - Feeding hen-hatched, 193
 - incubator, 193
 - Hatching, 191
 - in brooder, Putting, 201
 - incubator, Feeding the, 201
 - Rations for growing, 202
 - Separating the sexes, 201
- Chloral hydrate, 368
- Chloride of soda, 370
- Chloroform, 368
- Cholera, (see Hog-cholera)
- Cholera-infected herd, How to care for, 402
- Chromic acid or trioxid, 368
- Churn, Cleaning, 471
- Churning, Acidity of cream affects, 470
 - Difficult, Cause of, 436, 470
 - Feed affects, 470
 - Richness of cream affects, 470
 - Temperature affects, 470
 - The best, 469
 - Time for, 470
 - troubles, 470
- Clam, Hard, 184
 - Sea, culture uncertain, 185
 - Soft, 183
 - Distribution of, 183
- Clams, Cultivation of, 184
 - Harvesting, 184
 - Planting, 184
- Coal tar dip and disinfectant, 368
- Colic drench, 371
 - mixture, 371
- Collodion, Flexible, 368
- Colt, Navel and joint disease in, 271
- Colts, Castration of, 377
- Colostrum, Composition of, 437
- Condition powders, 371
- Copperas, 369
- Copper sulphate, 368
- Corrosive sublimate, 369
- Cough mixture, 371
- Cresol Comp., 368
- Cow, Ayrshire, milk records, 81
 - Brown Swiss, milk records, 81
 - Care of, 53
 - drench, How to, 365
 - fresh, Feeding, 54
 - individual, Feeding the, 53
 - good, How to know a, 50
 - Guernsey, milk records, 82
 - Holstein-Friesian, milk records, 82
 - Jersey, milk records, 83
 - Profitable, How long, 439
 - Spaying the, 380
 - stall, Length for different breeds, 450
 - Tapping the, 387
- Cows, brood, Handling, 63
 - Brushing, before milking, 450
 - clean, Poor arrangement for, 449
 - clean, Why and how to keep, 449

- Cows, Dairy, in 10 leading states, 87
 - Tests required, 448
 - healthy, Importance of, 448
 - milch, Number and value of, 84
 - Number and value of other, 84
- Cow's temperament, 438
- Crab, Blue, 185
 - Difficulty of propagating, 185
- Cream, Amount, in 1,000 pounds milk, 440
 - and milk, Weights of, 457
 - buttermaking, Handling for, 467
 - Fat content of, 440
 - gathering by deep setting method, 453
 - shallow pan method, 453
 - Homogenizer, 464
 - How to care for, 455
 - Ice, what it is, 440
 - Quality of, 467
 - Ripening, 467
 - rising, Time of, 436
 - Separator, 454
 - introduced, When, 466
 - Advantages of large, 454
 - Wash every time used, 454
 - Where to place, 455
 - gathering, shallow pan, Objections to, 453
 - Skimming, separating and caring for, 453
 - standardizing, 463
 - examples in, 464
 - points to observe in, 464
 - starter, Commercial cultures for, 467
 - Making a, 467
 - Stripper's milk, 470
 - Temperature for pasteurizing, 473
 - temperatures, Proper, for, 455
 - test, How to, 444
 - Two grades of, 464
 - What it is, 440
- Creamery, Construction of, 471
 - Cost of a, 471
 - coöperative, Organization of, 471
 - How many cows needed, 471
 - operated, Where can be, 471
- Curd test, Wisconsin, 445
- Dairies, Certified, production of, 458
 - Commercial, which buy feed and cows, 460
 - which raise feed and calves, 460
 - 3 groups of, 458
 - 2 groups of, 460
 - large, Advantages of, 461
 - depend upon milk sales, 458
 - Registered stock, 458
 - Dairy breeds, 80
 - commercial, Investment in, 460
 - requires good location, 459
 - good management, 459
 - moderate land values, 460
 - farm, Daily schedule of large, 461
 - farming, Advantages of, 446
 - herd, How to start, 49
 - in showing, 57
 - show, Fitting for, 57
 - Selecting a, 49
 - as source of profit, 58
 - industry, The, 434
 - Investment in, 446
 - in U. S., 446
 - Leading states in, 447
- Dairy, organization, Important in, 447
 - Value of, products, 446
 - products, Export value of, 446
 - Legal standards for important, 442
 - trade of U. S., 447
 - type, What it is, 79
 - utensils, How to care for, 452
 - Wash, with pure water, 449
- Dairying, Commercial, 458
 - Advantages of, 459
 - conditions necessary for success, 459
 - Disadvantages of, 459
 - market requirements, 459
 - requires good market, 460
 - Types of, 460
 - Factors of success in, 49
- Dairyman, What is a, 434
- Deer, Castrating, 167
 - does with buck, Number of, 167
 - European fallow, 167
 - fawns sold as pets, 167
- Feeding, 166
 - for parks, 167
 - Japanese Sika, 167
 - park, Fence for, 166
 - parks, 166
 - Raising fawns on cows' milk, 167
 - Virginia, 166
- Dehorning, After treatment, 381
 - Cattle, 381
- Desirable for fattening cattle, 64
- Dexter cattle, 72
- Diarrhea mixtures, 571
- Digitalis, 368
- Dips, 371
- Disease, War against, 389
- Diseases, Coöperation against, 389
 - cat, Common, 351
 - cattle, Common, 290
 - horse, Common, 262
 - dogs, Common, 351
 - Infectious, 389
 - Infectious, Why dangerous, 389
 - poultry, Common, 337
 - Recognizing animal, 261
 - sheep, Common, 315
 - swine, Common, 326
- Dog, Airedale, 161
 - Bathing the, 158
 - Beagle, 162
 - Bed for, 158
 - Belgian shepherd, 161
 - Bloodhound, 161
 - breed, When, to, 159
 - breeds, What, to buy, 164
 - Breeding the, 158
 - Expense of starting, 164
 - Boston terrier, 162
 - Bull terrier, 161
 - Care of the everyday, 157
 - Chesapeake Bay, 162
 - Chicken killing, 163
 - Chow, 162
 - Coach, 162
 - Collie, 161
 - Dachshund, 162
 - Dalmatian, 162
 - English Bull, 161
 - Eskimo, 162

- Dog, Exercise for, 158
 - farm, The, 154
 - Farm-bred preferred to kennel bred, 164
 - feed for, Best, 157
 - Feeding the, 157
 - feeds for, Special, 157
 - fleas, Killing, 160
 - Foxhound, 162
 - French Bull, 162
 - Gestation period of, 159
 - Giving medicine to, 161
 - Great Dane, 161
 - Greyhound, 162
 - Guard, 154
 - health hints, General, 160
 - Housebreaking the, 162
 - Hunting, 157
 - Japanese Spaniel, 162
 - kennel, Disinfecting the, 160
 - King Charles Spaniel, 162
 - Labrador, 162
 - Laxative for, 161
 - Maltese, 162
 - Manchester, 162
 - Mastiff, 161
 - Newfoundland, 161
 - Old English Sheep, 161
 - Pekingese, 162
 - Pomeranian, 162
 - Poodle, 162
 - profit, as source of, 157
 - Pug, 162
 - remedies, Simple, 161
 - Salt for, 157
 - Samoyede, 162
 - Schipperke, 162
 - shelter, 158
 - Sheep killing, 162
 - stock, for handling, 154
 - Sulphur and limewater for, 158
 - St. Bernard, 161
 - Table scraps for, 157
 - Teaching, to swim, 163
 - Terriers, 161
 - Tonic for skin trouble, 161
 - general, 161
 - train, How to, 162
 - Trained, a useful animal, 154
 - Training, cattle, 163
 - hunting, 163
 - Vermin, for destroying, 157
 - Water for, 158
 - Whelping, Treatment at, 159
 - Wolfhound, 161, 162
 - Worm medicine for, 160
 - Worms in, 160
- Dogs, Breeds for special purposes, 161
 - Guards and watch, 161
 - House for raising, 163
 - Mongrel, 162
 - profit, raising for, 163
 - Registering, 164
 - Retrievers, 162
 - Selling, 164
 - Setters, 162
 - Sheep and cattle, 161
 - Sporting, 161
 - Vermin killers, 161
- Doses, Animal, 362
 - Cattle, 362
 - Dogs, 362
 - for different ages, 362
 - Horses, 362
 - How to regulate, 362
 - Sheep, 362
- Drugs and doses for farm use, 361
 - medicines and their uses, 366
 - Concentrated, Giving, 365
 - Powdered, Giving, 365
- Drying or dusting powder, 372
- Dusting powder (cheap), 372
- Duck, Aylesbury, 225
 - Black East India, 225
 - Breeders, Care of, 227
 - Blue Swedish, 225
 - Call, 225
 - Cayuga, 226
 - Crested white, 226
 - eggs, Cooling, 226
 - Hatching with hens, 226
 - with incubators, 226
 - Period of incubation, 226
 - Temperature for hatching, 226
 - Thermometer on, 226
 - feathers, Curing, 227
 - Muscovy, 226
 - Pekin, 226
 - the leading commercial, 228
 - products always marketable, 225
 - raising, Commercial, 228
 - Conditions necessary for, 225
 - Equipment for, 228
 - Important factors in, 228
 - Incubator room for, 228
 - on farm, 226
 - Rouen, 226
 - Runner, 226
 - yards, Lanterns in, 225
- Ducklings as food, 225
 - brooder houses for, 228
 - Brooding, 226
 - care of, Later, 227
 - Distinguishing sex of, 227
 - Drinking fountain for, 227
 - Feed for young, 227
 - Teaching, to drink, 227
- Ducks and how to raise them, 225
 - breeders, Disposing of, 227
 - Feed for, 227
 - Shelter of, 227
 - Water for, 227
 - Breeds for farmer, 225
 - Home and market, 225
 - Killing and dressing, 227
 - Leg weakness of, 225
 - market, Packing, 227
 - Raising, for, 227
 - Ration for, 227
- Egg-laying contests, 215
- Egg production, Commercial, 204
 - Feeding for, 204
 - receipts at leading markets, 216
- Eggs absorb odors, 205
- Candling, 196
 - cold storage, Keeping in, 196
 - Different grades of, 205

- Eggs, Exports of, 216
 - Fertile, spoil quickly, 188
 - Fresh-laid, for market, 196
 - Gathering, grading and packing, 205
 - Gathering, regularly, 196
 - Handling incubator, 200
 - hatchable, Requirements for, 191
 - Hatching, keeping, 199
 - Requirements for, 199
 - Selecting, for, 199
 - Incubation, Loss of weight during, 200
 - Turning and cooling, 200
 - Market, 196
 - Establishing a, 205
 - Marketing, 205
 - Premium on higher grades, 205
 - preserve, How to, 196
 - Preserving, with water glass, 196
 - selling, Personally, 205
 - Sterile, keep best, 188
 - Trademark for, 205
- Electuary, 372
- Elk, American, 167
- Entrails for sausage casings, 501
- Enzymes in milk, 436
- Epsom salts, 368
- Eserine sulphate, 368
- Esophagotomy, 385
- Ether, Spirits of nitrous, 368
 - Sulphuric, 368
- Eucalyptus oil, 368
- Ewe, Feed for newly-lambled, 94
 - lamb, Adopting other, 107
 - lamb, and her, 106
 - lambing, Aiding at, 94
 - lambing time, Care of, at, 94
 - pregnant, Feed for, 93
 - needs exercise, 93
- Ewes, Breeding, in good condition, 91
 - Number of, with ram, 91
 - in winter, 93
- Farcy or skin glanders, 424
 - Symptoms of, 425
- Farm animals, their care in sickness, 261
 - products, Disposing of, 433
 - sea, Advantages of, 182
 - trout, Requirements of, 177
- Farming, Fresh water, 176
 - Salt water, 182
 - sea, How laws affect, 182
 - What it is, 182
 - Water, 175
- Fat in milk, 436
 - Importance of, 436
 - Uses for, 501
- Ferrets, Care of, 172
- Feed for ewes, 94
- Feeding systems, 61
- Fever mixtures, 372
- Fish, Breeding grounds for, 179
 - Carp, Breeding pond for, 180
 - Demand for, 179
 - culture undesirable, 179
 - crop, Harvesting the, 181
 - Cultivation of, 175
 - culture, Artificial, 170
 - farm, Two methods of, 176
 - Legal aspects of, 181
- Fish, culture, Natural, 176
 - diseased, Treatment for, 180
 - Diseases of cultivated, 180
 - farm, commercial, Size of, 178
 - farming, Requirements for, 176
 - for stocking pond, Free, 181
 - Gold, culture, 180
 - Increasing demand for, 180
 - pond, Aquatic plants for, 179
 - Forage for, 179
 - from stream undesirable, 178
 - Size of, for family, 178
 - Water supply for, 178
 - must be cleaned, 178
 - Propagating cold-water, 176
 - Warm-water, 177
 - raise, What to, 176
 - raising by natural method, 178
 - on the farm, 176
 - salt water, Propagation, not feasible, 180
 - Small-mouthed Black bass, 179
 - Scarcity of, 175
 - Shell, culture, 182
 - Flow of water necessary, 183
 - Food for, 182
 - Hatching of, 183
 - Sexes of, 182
 - Special types and their care, 179
 - trap safest plan, 181
 - waters, Cold, 176
 - Warm, 176
- Fishes, 171
- Fly repellants, 372
- Flowers of sulphur, 370
- Foal, Care up to weaning, 20
 - disorders of, Common, 20
 - Feeding, by hand, 19
 - First meal, 19
 - Weaning, 20
 - weaning, Care after, 20
- Formaldehyde, 368
- Fowl, Ancona, 206
 - Andalusian, Blue, 206
 - Bantam, Malay, 212
 - Black Spanish, White Faced, 209
 - Brahma, 209
 - breeds and varieties, Ornamental, 211
 - Table of all, 212
 - Utility, in America, 212
 - breeding, Characteristics required, 213
 - combination, 213
 - Cross undesirable, 214
 - for color, 214
 - for fancy, 213
 - for usefulness, 213
 - selection of, 213
- Buckeye, 209
- Buttercup or Sicilian Buttercup, 209
- Campine, 209
- Cochin, 209
- Cornish, 209
- Crevecoeur, 209
- Domestic, Classifying, 206
 - Types and breeds of, 206
- Dominique, 209
- Dorking, 209
- farm, Best for, 187
- Faverolle, 209
- Feed for fattening, 194

- Fowl, Frizzle, 212**
 Game, 211
 Bantam, 211
 Houdan, 210
 grouped, How are, 206
 inbreeding not advisable, 214
 Java, 210
 Keeping one breed best, 206
 line-breeding described, 214
 killing, Methods of, 194
 through the mouth, 194
 La Fleche, 210
 Lakenvelder, 210
 Langshan, 210
 Leghorn, 210
 Malay, 212
 mating cockerel, 215
 Double, 215
 Intermediate, 215
 Single, 215
 Minorca, 210
 Methods of starting flock, 187
 Orpington, 211
 Outbreeding to improve flock, 214
 picking, Dry, 195
 Plymouth Rock, 211
 Polish, 211
 Pullet mating of, 215
 Purebred best, 206
 Qualities to consider, 187
 rations for the farm, Cheap, 194
 Redcap, 211
 Rhode Island Red, 211
 White, 211
 Scalding, for picking, 195
 Silky, 212
 Selecting the, 187
 Selection and breeding combined, 214
 Standard, more desirable, 213
 standards of judging, Two, 206
 Sultan, 212
 Sumatra, 212
 Utility breeds and varieties, 206
 Wyandotte, 211
- Fox breeders, Den for, 170**
 farming successful, 169
 pelts, Prices of, 170
 Silver black, most profitable, 169
 Blue, 170
 breed, When to, 170
 breeders, Cost of, 170
 Breeding, 169
 feed, How to, 170
 Fence for, 169
 fencing and dens, Cost of, 170
 Gestation period of, 170
 Red, for hunting, 170
 Yard for pair, 169
- Friar's Balsam, 367**
Frog culture, 180
Frogs' eggs, Hatching, 180
 Protecting young, 180
 species of, Four, 180
- Fur animals, 170**
 a source of income, 510
 Raising, 109
 suited to climate, 169
- Furs valuable only in cold weather, 510**
- Game Animals, Open seasons for, 510**
 License to trap, required, 510
 trapped, To kill, 511
- Gelsemium, 368**
Gentian, 368
Geese, African, 229
 breeders, Age for, 230
 Breeding, 230
 Breeds of, 229
 Chinese, 229
 Demand for, 228
 Eggs, Hatching, under hens, 230
 Incubation period of, 230
 Egyptian, 229
 Embden, 229
 farms, raised mostly on, 228
 fattening in pens, 230
 feathers, Demand for, 230
 Prices of, 230
 Feeding for egg production, 230
 Green stuff important, 230
 Killing and picking, 230
 Marketing, 230
 Mating breeding, 230
 Nests for, 230
 Number, to gander, 230
 Picking live, 230
 Prices of, 230
 raise, How to, 225
 Raising, 228
 Conditions needed for, 229
 Returns from, 230
 Toulouse, 229
 Wild or Canadian, 229
- Ginger, 368**
Goslings, Care of, 230
 Fattening, 230
 Feeding, 230
- Glanders, 424**
 Acute and chronic, 424
 Blood test for, 426
 Cause of, 424
 Chronic, becomes acute, 425
 Control and prevention of, 427
 Diagnosis of, 425
 Eye test for, 426
 fatal to man, 424
 General symptoms of, 425
 horse and mule disease, 424
 Laws controlling, 427
 Mallein test for, 426
 Period of incubation, 424
 Reliable tests for, 426
 Several diseases mistaken for, 426
 spread, How, 426
 "spreaders" should be destroyed, 427
 Symptoms of, 425
 widely spread, 424
- Glauber salts, 368**
Glycerine, 369
Goat, Telling age of, 181
 Anglo-Nubian, 127
 Angora, 122
 Association, 126
 buck in condition, 124
 doe at kidding time, 124
 leather, 126
 Length of fleece, 125
 Management of flock, 123

- Goat, Angora, meat, 126
 - pasture, 123
 - Prices for fleece, 126
 - products, 125
 - Skins, 126
 - Value of fleece, 125
 - Weight of fleece, 125
 - Where raised, 122
- Goats, Breeding, 124
 - age of, 124
 - Castrating bucks, 125
 - Corral method for, 124
 - Dipping, 125
 - Feeding, 123
 - Gestation period of, 124
 - History of, 126
 - in U. S., 509
 - Importance of, 126
 - kids, Care of, 125
 - land clearers, 126
 - pets, 126
 - Prices for, 126
 - Salt and tobacco for, 124
 - Shearing, 125
 - Staking method for, 124
 - Water for, 124
 - dip for, Good, 131
- Kids, raising, 128
- Lumps on jaw of kids, 131
- Maltese, 127
- Milk, 127
 - Advantages of, 127
 - breeding, 128
 - does, 129
 - Breeds of, 127
 - Buildings for, 129
 - cost less than cows, 127
 - Cost of, 128
 - of keeping, 128
 - dairy animals, 127
 - Effect of environment, 127
 - free from tuberculosis, 127
 - Grades of, 128
 - Importations of, 130
 - management, 128
 - Milking the does, 129
 - need company, 127
 - Pasture for, 129
 - Purebred, superior, 128
 - Qualities of, 127
 - Raising, profitable, 127
 - Renting, does, 128
 - Skins, for leather, 130
 - where raised, 130
- Goats' milk, Cheese from, 128
 - Cheese, Making, 130
 - for infants, 129
 - Prices of, 128
 - New Mexico, 128
 - Nubian, 128
 - and goat raising, 122
 - Saanen, 127
 - Spanish-Maltese, 128
 - Three types of, 122
 - Toggenburg, 127
- Green feed necessary for chicks, 193
- Guinea fowl, 258
 - eggs, 258
 - Incubation period of, 258
- Guinea fowl, Egg-laying habits, 258
 - Feeding keets, 258
 - great foragers, 258
 - Half wild, 258
 - housing, 258
 - Market for, 258
 - Objections to, 258
 - Starting with, 258
 - pigs (Cavies), 168
- Gullet, Opening the, 385
- Hair and bristles, Uses for, 502
- Hamamelis, 370
- Hams and bacon, Time in brine, 497
- Harness, Care of, 11 (See Vol. III.)
 - for the horse, 10
- Hatching with hens, 191
- Healing or gall ointment, 372
 - powder I, 372
 - powder II, 372
- Heart, How prepared for food, 502
- Heave powders, 372
- Heifers, Care of, 56
 - When to breed, 56
- Herd, dairy, Care of the, 49
- Hen, Number of eggs for, 192
 - sitting, Dusting the, 192
- Hens, Characteristics of heavy laying, 216
 - eggs, Incubation period of, 192
 - Feeding the laying, 204
 - Hatching, Handling, 191
 - Hatching with, 191
 - How many, to male, 188
 - Hopper feeding for, 204
 - laying, Rations for, 205
 - nest, Making the hatching, 191
 - Pelvic bone test for laying, 216
 - Selecting the best, 191
 - trapnesting, Method of, 215
- Hides, Disposing of, 502
 - How to pack and ship, 502
- Hog cholera, 399
 - Acute and chronic, 401
 - After care, 405
 - Causes of, 399
 - Cleaning up after, 402
 - control, Countrywide, 405
 - How carried, 400
 - contracted, 399
 - Incubation period of, 400
 - incurable, 403
 - Losses from, 399
 - Mortality in, 399
 - post-mortem examinations, 401
 - Predisposing causes, 400
 - prevention, 143, 403
 - serum and virus, Doses of, 405
 - How much to use, 405
 - How produced, 404
 - What it is, 404
 - Where obtained, 404
 - single treatment, 404
 - Symptoms of, 400
 - vaccinating, 402
 - double, 404
 - single, 404
 - What it is, 399
- drench, How to, 365
- leaf lard, Removing, 492

- Hog, lots, Cleaning up, 403**
 raising, Advantages of, 132
 Scalding, 491
 Sticking and bleeding, 491
 viscera, Removing the, 492
- Hogs, cholera, Burning carcasses of, 402**
 Disinfecting, 402
 infected, Best place for, 402
 Ration for, 402
- Choosing the breed, 133
 Costs and profits, 143
 Cross breeding, 136
 Dairy by-products for, 142
 Different types of, 134
 Dipping, 142
 Feeding, 140
 feeds, Variety of, essential, 140
 Fencing and yardage for, 133
 Forage crops for, 141
 Grain-fed, superior, 143
 Healthy, are safest, 403
 How to raise, 132
 Inbreeding, risky, 136
 Light-weight, preferred, 140
 Marking, 142
 Marketing, 143
 Proportion of different products, 483
 Quarantine, from other herds, 403
 rations, Sample, for dry-lot feeding, 141
 for fat, 141
 Seeding mixtures for feeding, 142
 Shelter for, 133
 Shoats, Rations for, 141
 Starting a herd, 135
 Vaccinating, Two methods of, 404
 Worms in, 142
- Horns and hoofs, Uses for, 501**
- Horse, Azoturia of, 269**
 Bedding, 9
 Blanketing, 9
 Blind staggers in, 270
 Blood worms in, 285
 Bog spavin on, 285
 Bone fractures on, 279
 Spavin on, 284
 Bots in, 286
 Breathing system of, 264
 Bronchitis in, 276
 Burns and scalds on, 289
 Capped hock on, 281
 Care of, 8
 farm work, 5, 13
 Cerebro-spinal meningitis in, 270
 Catarrh (cold in head) in, 275
 characteristics to observe, 266
 Choke of, 271
 Chorea, "crampiness," "shivering" in, 278
 Chronic catarrh (nasal gleet) in, 275
 Circulatory system of, 264
 Clipping, 9
 Colic (Flatulent or wind) in, 273
 (Spasmodic or cramp) in, 273
 collar, Fitting the, 10
 Congestion of lungs in, 276
 Constipation of, 272
 Contracted hoof on, 282
 Corns on, 283
 Cough in, 275
 Cracked heels on, 287
- Horse, Curb in, 279**
 Dentistry for the, 382
 Diabetes insipidus in, 274
 Diarrhea of, 272
 Digestive system of, 263
 Organs, duties of, 263
 Discharge from nostrils of, 266
 diseases of, Common, 262
 General, 269
 Dislocation of knee cap, 279
 to drench, How, 365
 Docking and nicking, 382
 Eczema—"summer itch" on, 287
 Enteritis (inflammation of bowels), 274
 Feces of, 266
 Feeding the, 5
 feet, Care of, 11
 Firing, 383
 Fly Nets for, 10
 Foul and swollen sheath in, 289
 Founder (Laminitis) in, 280
 Genital system of two sexes, 265
 Grain feeds for, 7
 Grease on, 288
 Grooming and brushing, 9
 pulse of, Feeling the, 265
 Harness for, 10
 Sores and tumors on, 289
 Hat for, 10
 Hay for, 6
 Heaves, broken wind in, 270
 Impaction of bowels in, 272
 Indigestion (acute) in, 273
 (Chronic) in, 272
 Influenza in, 275
 Knuckling or cocked ankle in, 281
 Lameness, Detection of, 277
 Testing for, in motion, 278
 Testing for, in stall, 278
 Other signs of, 278
 Lampas or lampers in, 382
 Laryngitis (sore throat), 274
 legs and feet of, Diseases of the, 277
 Lice on, 286
 Lockjaw (Tetanus) of, 270
 Lymphangitis, 269
 Mange on, 286
 Moon blindness in, 270
 Mucous membranes of, 266
 Mud fever on, 288
 Muscular system of, 262
 Nail prick in, 284
 Navicular disease in, 284
 Nervous system of, 265
 Nettle rash, Surfeit, prickly heat, 288
 Nicking the tail, 382
 Parasites and skin diseases of, 285
 Pin worms in, 286
 Pleurisy in, 276
 Pneumonia (lung fever) in, 276
 Position of, in different diseases, 266
 Practical, breeding, 14
 Pulse of, 266
 Purpura hemorrhagica in, 277
 Quittor on, 282
 Rations, 6
 Respiration of, 266
 Rheumatism in, 278
 Ringbone on, 281

- Horse, Ringworm on, 286
 - Round worms in, 285
 - Roaring in, 276
 - Rules of driving, 12
 - Scratches on, 287
 - Shoe boil on, 281
 - Shoeing, 11
 - shoes for unsound feet, 12
 - Side bone on, 282
 - Skeleton of the, 262
 - Skin and coat of, 266
 - Special senses of, 266
 - Splints on, 281
 - Sprains in, 280
 - stable, 8 (see Vol. III)
 - stalls, 8
 - Strangles (colt distemper), 274
 - Stringhalt in, 279
 - Summer sores on, 287
 - Special care in, 9
 - Sunstroke and heat exhaustion in, 271
 - Sweeney ("shoulder slip") in, 280
 - symptoms, Index of, 267, 268
 - winter, Special care in, 9
 - Tail rubbing of, 288
 - Tapping the, 387
 - Temperature of, 266
 - Thoroughpin on, 285
 - Thrush on, 283
 - To distract attention, 377
 - Unnerving, 388
 - Urinary system of, 265
 - Urine of, 266
 - Warts on, 288
 - Watering, 7
 - Wind galls on, 285
 - Worms in, 285
- Horses' age told by teeth, 264
 - blood consists of, 265
 - body, The, 262
 - breathing, of what it consists, 264
 - breed, Kind of, to, 14
 - Sound, 15
 - When to, 15
 - Breeding age of, 265
 - digestive system, Importance of, 264
 - Farm types of, 14
- Hydrophobia, 431
- Incubation, Large-scale, 198
 - systems, 198
- Incubator, Caring for the, 200
 - Filling the, 199
 - Follow directions with, 192
 - mammoth, A 12-unit, 197
 - Preferred, 199
 - management, 199
 - Starting it properly, 199
 - temperatures and thermometers, 199
 - thermometer, Location of, 199
 - Testing the, 200
 - Ventilation and moisture for, 200
- Incubators, Hatching with, 192
- Indian Hemp, 866
- Injections, How to give, 366
 - Rectal, 366
 - Uterine, 366
 - Vaginal, 366
- Iodine, 369
- Iodoform, 369
- Iron chloride, 369
- Sulphate, 369
- Lactation period, Length of, 439
 - Tests during, 439
- Lamb and mutton, Cutting, 490
 - Care of the new-born, 94
 - Clubs of Tennessee, 507
- Lambing grounds, Suitable, 106
 - on western ranch, 106
 - shelters on range, 106
- Lambs, Castrating, 96, 379
 - Docking, 96
 - hothouse, Dressing, 490
 - or mutton, Dressing, 489
 - Range, "marking up," 107
 - When marketed, 107
 - Scours of, 321
- Lampas or lampers, 382
- Lard, Trying out, 500
- Lead acetate, 369
- Lime, 369
 - Water, 369
- Lincolnshire, Red, Cattle, 70
- Linseed oil, 369
- Liver, How prepared for food, 502
- Lobster, Decline of the, 185
- Lobsters, Artificial hatching of, 185
 - cultivation, Factors necessary for, 185
 - Rate of growth of, 185
- Lunar caustic, 370
- Mare, Breeding, after foaling, 19
 - age of, 17
 - Brood, 17
 - foaling, Care after, 19
 - Care at, 18
 - Gestation period of, 18
 - Pregnant, Care of the, 17
 - Preparation for foaling, 18
 - Signs of foaling, 18
 - Spaying the, 380
- Martens, Breeding in captivity, 171
 - Feed for, 171
 - Pens for, 171
 - Price of pelts, 171
- Mash, Dry, for chicks, 193
- Measures, Approximate, 361
- Meat, brine-cured, Vessels for, 497
 - butcher, When to, 482
 - by-products, Edible, 502
 - carcass, Finding cost of, 484
 - cured, Kinds of, 496
 - curing, Baking soda in, 496
 - Ingredients used, 496
 - Objects of, 496
 - Regulations of U. S. Dept. of Agriculture, 497
 - Salt in, 496
 - Saltpeter in, 496
 - Sugar or molasses in, 496
 - Two methods of, 496
 - What law allows, 496
- Estimating retail prices, 484
- Keeping by freezing, 482
- Home-dressed, Advantages of, 482
- Market value, How found, 484
- Proportion, to live weight, 483

- Meat, Quick cooling necessary, 483**
 - smoked, Keeping, 498
 - Smoking, 498
 - Best fuel for, 498
 - supply, The farmer's 482
- Cured, and by-products, 496
- Medicine, How to give, 365**
- Merino sheep as range breed, 98**
- Methylene Blue, 369**
- Mexicans as sheep herders, 101**
- Mercurial ointment, 369**
- Mercuric biniodide, 369**
 - Chloride, 369
 - oleate, 369
- Milk, Acidity test for, 444**
 - How to make, 444
 - and health, 448
 - Babcock test for, 443
 - Babies, from several cows, 436
 - Bacteria allowed in, 465
 - Bitter, Causes of, 451
 - Preventing, 451
 - bottling plants, country, Disadvantages of, 462
 - breeds, Different, 437
 - calving, Changes in, after, 437
 - cause of human disease, 448
 - cheese, Paying for, 480
 - City health regulations for, 464, 465
 - Temperature for, 465
 - clean, Keeping, 451
 - Cleanliness and bitter, 451
 - cooling, Importance of, 452
 - Colostrum for cheese, 437
 - how detected, 437
 - Composition of, 435
 - of different mammals, 437
 - peculiar to breed, 437
 - Purebred cows', 438
 - condensed, How to test, 444
 - What it is, 441
 - cooler, A special, is best, 452
 - cows, Exceptional, 438
 - varies and why, 437
 - dried, or milk powder, 441
 - farm, Care and use of, 448
 - farmer's responsibility, 443
 - Fat in, 436
 - filth from cow's body, 449
 - flow, Cows' temperament, influenced by, 438
 - Increasing, 54
 - influenced by conditions, 439
 - by various causes, 438
 - varies at different periods, 438
 - What controls, 434
 - food, as a, 434
 - "Fore" and "strippings," 439
 - goats', 436
 - Prices of, 128
 - handled by diseased persons not safe, 443
 - handling in city, 462
 - on dairy farm, 461
 - How often to, 451
 - good, How soon after calving, 437
 - indicates health of cow, 438
 - kinds of, Different, 436
 - How made, 434
 - mares', 436
 - Morning's and night's, 439
- Milk pail, Small-topped, excludes dirt, 450**
 - pasteurization, Field method of, 396
- Pasteurizing, for butter, 472**
 - plant, City bottling, 463
 - bottle and can washing, 463
 - delivering, 463
 - handling in, 462
 - investment in, 462
 - location of, 462
 - must be attractive, 462
 - Pasteurizing in, 463
 - What goes on in, 462
- Pooling system of paying for, 480**
- Problems in selling, in different ways, 457**
- producing period, Man has lengthened, 435**
- products, 440**
 - and its, 434
- Standards and tests for, 441**
- production and composition, Conditions**
 - that influence, 438
 - "average cow," 438
 - Problems of large-scale, 458
- Protecting, on journey, 462**
- quality and flow influenced by surroundings, 439**
 - varies at different periods, 438
- records, Competition for, 438**
- records, cows,' 3 purebred, 438**
 - Keeping, 56
 - Record, World's, 82
- Sediment test, 445**
 - or cream, Shall we sell, 456
- Separator, valuable for feeding, 454**
- sheep's, 436**
- skimmed, Testing, 444**
- strain, Does it pay to, 452**
- strainer, Best, 452**
 - cloth, Useless, 452
- supply, safe, Demands, 448**
- sugar (lactose), 435**
- sweet, How to keep, 452**
- test, How to, 443**
 - Why, 441
- tests required by law, 441**
- Transportation of, 461**
- What is, 434**
 - good, 441
 - Why and how to cool, 452
 - woman's, Composition of, 437
- Milker, "Good", worth more, 439**
- Milkers who do nothing else, 461**
- Milking and clean milk, 450**
 - conditions should be right, 450
- Manner of, 439**
- methods, 54**
- part of day's work, 450**
- period, The, 438**
- periods, Number of, 439**
- Proper methods, 450**
- Right, most difficult, 450**
- machine, The, 451**
 - Advantages of, 451
 - Cost of, 451
 - must be kept clean, 451
 - When, advisable, 451
- Shorthorn Association, 72**
 - records, 78
- Shorthorns, 70, 72**
- Minks, Breeding, 171**

- Minks, Feed for, 171**
 for fur, 170
 Gestation period of, 171
 Nest-box for, 171
 Pens for, 171
 raising abandoned, 169
 Rutting season, 171
- Mohair, 125**
 Growers' Association, National, 509
 Handling, 509
 Proper length of, 509
 Shearing and handling, 509
 What it is, 509
- Mollusks, Other, 184**
- Morphine sulphate, 369**
- Mule breeding stock, 21**
- Mules, Advantages of, 21**
 Best mares to produce, 21
 jack, Good, 21
 production, 21
 Training jack for service, 21
- Musk rats profitable in marshes or pond, 172**
 unprofitable in pens, 172
- Mussel, Sea, ranks high as food, 185**
- Mustard, 369**
- Mutton carcass, Finding cost of, 484**
 Flank and plate, 490
 Kidney fat, 491
 Leg of, 491
 Neck, 491
 Rack and loin, 491
 Shoulder, 491
- Nitric acid, 369**
- Neurotomy, 388**
- Nursery record, 237**
- Nux vomica, 370**
- Operations, How to restrain animals for, 376**
 Index of, 375
- Opossums, Demand for, skins, 172**
 Easy to keep, 172
 Flesh sells readily, 172
 Prolificacy of, 172
- Otters in captivity, 172**
- Oyster, American, native Atlantic Ocean, 183**
 Artificial cultivation of, 183
 farming, Protection for, 183
 grant, How to select an, 183
 grows faster in Southern waters, 183
 natural beds destroyed, 183
 spat collecting, 183
- Oysters, Implements for harvesting, 183**
- Parturition, Help at, 383**
- Paunch, Opening the, 385**
- Pelt, cased, How to skin a, 511**
 flat, How to skin a, 511
 stretchers, 512
- Pelts, to cure, How, 512**
 Packing and shipping, 502
 Selling and packing, 512
 skin, How to, 511
- Percentage table, 362**
- Phytolacca, 370**
- Pigs, Castrating, 142**
 Factors, Necessary to success, 132
 feeding, Liberal, necessary, 135
 feeds, Mineral, for, 140
- Pigs, raising, Factors in profits, 135**
 suckling, Rations for, 141
 weaned, Treatment of, 140
 Weaning, 139
 weanling, Rations for, 141
 young, Exercise for, 139
- Pigeon by-products, 237**
 disease prevention best, 238
 feeding box, Combination, 233
 flying pen, 234
 industry, Two branches of, 231
 loft, Capacity of, 232
 Cleaning, 235
 Construction of, 232
 Design of, 232
 Site of, important, 232
 The, 232
 manure, Value of, 237
 nests, Construction of, 233
 nursery pen, 233
 raising and squab production, 231
 means, What, 231
 squab tonic, 238
- Pigeons, Banding, 236**
 Bath for, 235
 breeding, Guaranteed, 232
 Raising, for sale, 231
 breeds, Most popular, of, 231
 Canker in, 238
 Cholera in, 238
 Diphtheria in, 238
 Diseases of, 238
 eggs laid, Number of, 236
 Feeding, 234
 feeds for, Best, 234
 General management of, 234
 grains for, Seasoned, 234
 that should not be fed, 235
 going light, 238
 Grit and charcoal necessary for, 235
 lice, Protecting from, 235
 Mating, 236
 molt, When, 237
 molting, Feed for, 237
 Nesting material for, 236
 Profit in breeding, 231
 quarters for, Makeshift, 234
 rations for, Summer, 235
 Winter, 235
 records of, Keeping, 236
 Roup in, 238
 Salt for, 235
 sex of, Distinguishing, 236
 sick, Symptoms of, 238
 Starting with, 231
 Worms in, 238
 young, Care of, 237
 Feed for, 237
 Feeding the, 236
- Plaster casts, How to apply, 366**
- Poke Root, 370**
- Pork carcasses, Cutting, 492**
 Splitting, 492
 cured, Dry, 497
 Sugar, 497
 hams, 493
 head, 493
 middle, 493
 salted, Dry, 498

- Pork, Plain, 497**
 Shoulder of, 498
Potash, 370
Potassium, 370
 chlorate, 370
 iodide, 370
 nitrate, 370
 permanganate, 370
Poultice, jaws or throat, 366
Poultices, apply, How to, 366
Poultry and birds, 187
 breeding, Principles of, 218
 stock, Developing, 202
 Selecting, 191
 breeds and breeding, 206
 Caponizing, Appendix (p. 558)
 Commercial, production, What it is, 197
 Three kinds of, 198
 Exhibitions, 215
 farm flock of, Care of the, 187
 Farms devoted to, 217
 Special overlap, 198
 Fattening plants for, 217
 Time for, 203
 feed, Green, for, 193
 house, Essentials for, 188
 Litter for, 188
 Open-front best, 188
 should be clean, 188
 ideals and standards, 213
 industry, Importance of, 216
 The, 206
 keeping, Development of, 216
 killing, Bloodless method of, 194
 market, 203
 Males, Choosing, for breeding, 191
 man, Aids to the, 217
 market stock, Developing, 202
 Feeding for, 202
 "Plumping" dressed, 204
 producers, commercial, Who are, 197
 Production, Commercial, 197
 determined by market demands, 217
 farm, Leading states in, 217
 Rations for fattening, 203
 Salt fatal to, 194
 Scalding, 203
 Sticking, 203
 Schools of, breeding, 213
 surplus, How to market, 194
 Table scraps for, 194
 yard, 188
 fence, Height of, 191
Pullets, Placing on range, 201
Prawns on Atlantic Coast, 185
Proportion table, 362
Puppies, Care of the, 159
 Feeding the, 159
 Weaning the, 159
Purgative ball (Horse), 372
Pyoktanin, 369
- Quahaug, Adaptability of the, 184**
 grant, Selecting a, 184
Quahaugs, 184
 How taken, 184
 Size of, 184
 Yield of acre of, 184
- Quinine sulphate, 370**
Quittor injection, Caustic, 372
- Rabbit Hutches, 168**
Rabbits and hares, 168
 Breeding, 168
 farm, can be raised on, 168
 Feeding, 168
 kill, How to, 168
 Marketing, 168
 Most profitable kinds, 168
 Origin of, 168
 Price in market, 168
 skins, Market value of, 168
Rabies, 424, 431
 affects all warm-blooded animals, 431
 Cause of, 431
 Pasteur treatment for, 432
 Period of incubation, 431
 Symptoms of, 431
 transmitted, How, 431
 Treatment for, 432
 What it is, 431
Raccoons breed once yearly, 172
 kept and fed, easily, 172
 Yards for, 172
Ram, breeding, Ration for, 91
 Care of, 91
Rams, Castration of, 379
Red Lincolnshire cattle, 72
Red pepper, 368
Red Poll cattle, 71
Refrigerant lotion I, 372
 Lotion II, 372
 Rennet, Making, 501
 Test, 501
Rumenotomy, 385
- Salicylate of soda, 370**
Salicylic acid, 370
Salt, 370
Saltpeter, 370
Salol, 370
Santonin, 370
Sausage, Bologna, 499
 Head cheese, 500
 making, Object of, 499
 Pork, 499
 Seasoning for, 499
 Sausages and sausage making, 499
 Liver and blood, 500
Scallop cultivation difficult, 185
Scallops, Age limit of, 185
 Age of, for market, 185
 Two species of, 184
Scrapple, 500
Scratches ointment, 372
Seaweed industry not developed, 186
 profitable, 186
 planting gives good results, 186
 Products from, 186
Sheep, Advantages of, 111
 Ascites of, 318
 Barbadoes or Woolless, 112
 Black faced Highland, 113
 Bloat, 320
 breed of, Best, 90
 Breeds of, 112
 Table of, 116,

- Sheep, breeds, Weights of different, 111
 - Breeding age of, 316
 - season of, 90
 - Buildings for, 92
 - Bronchitis, 322
 - body and its work, 315
 - Catarrh, 322
 - Catarrhal fever, 320
 - Catching correctly, 505
 - pen for, 505
 - Characteristics of, 110
 - Cheviot, 113
 - Cold, 322
 - Colic or stretches, 321
 - Combination type of, 111
 - Constipation, 321
 - Corriedale, 113
 - Cotswold, 113
 - coupling, Hand, 91
 - Dartmoor, 113
 - Diarrhea, 321
 - Common, 315
 - Disease, Index of symptoms, 316
 - Diseases, breathing system, 322
 - digestive System, 320
 - Eye, 318
 - of, General, 318
 - Infectious, 319
 - Dipping, 97
 - Docking and trimming, 96
 - dogs are "taboo", 102
 - Dorset Horn, 114
 - drench, How to, 365
 - Dropsy of the abdomen, 318
 - Dysentery, 321
 - Exmoor Horn, 114
 - farm, profitable on, 90
 - farmers aided by Forest Service, 109
 - feet, Trimming the, 97
 - Founder, 318
 - foundation flock, Cost of, 109
 - Gestation period of, 316
 - Foot rot, 319
 - Garget, 318
 - Gid, 324
 - Goitre, 318
 - Grazing without water, 105
 - Grub in the head, 323
 - Hampshire Down, 114
 - handle, How to, 489
 - healthy, Keeping, 96
 - Hemorrhagic Septicemia, 320
 - herder and his work, 100
 - herders, Bascos as, 101
 - Mexicans as, 101
 - outfit, 101
 - herding methods, 102
 - system, Better under new, 105
 - New, 102
 - "open", 105
 - Herdwick, 114
 - home of, Original, 112
 - Housing, 92
 - Impaction of rumen, 321
 - Indians, kept by, 99
 - industry, 119
 - Inflammation of womb, 320
 - itch, 323
 - Jaundice, 321
- Sheep, Karakule or Arabi, 114
 - Kerry Hill, 115
 - Killing the, 489
 - Proper place for, 489
 - Lameness, 318
 - Laryngitis, 322
 - Laminitis, 318
 - Leicester, 115
 - lice, 323
 - Lincoln, 115
 - lip and leg ulceration, 319
 - Liver flushes, 324
 - Liver rot, 324
 - Lonk, 115
 - Lung worm, 325
 - in, raising, Leading states, 121
 - Maggots, 324
 - Mammitis, 318
 - Mange, 323
 - Marking, 97
 - market, Fitting for, 96
 - Merino, 115
 - Metritis, 320
 - Mexico, introduced from, 99
 - mutton, Removing viscera, 490
 - Skinning the, 489
 - Type of, 111
 - Navel and joint disease, 320
 - Necrobacillosis, 319
 - Nodular worm, 325
 - Ophthalmia, 318
 - Oxford Down, 117
 - painted, Should not be, 505
 - parasites and diseases they cause, 323
 - Parturient fever, 320
 - Persian, 117
 - Plants poisonous to, 108
 - Pleurisy, 322
 - Pneumonia, 322
 - pox, 320
 - price of, Increase in, 120
 - Purebred, best, 90
 - raised, Where, 111
 - raising, 90
 - developed, How, 110
 - Leading countries, 119
 - Rambouillet, 117
 - ranching, Development of Western, 99
 - range animals, as, 98
 - breed, Merino, as, 98
 - business, Cost of starting, 109
 - business for beginners, 109
 - costs, 99
 - Dipping the, 105
 - Diseases of, 108
 - flock of, "Markers" in, 101
 - grazing costs, 100
 - losses on, 108
 - management of, 98
 - outfits, 99
 - Poisonous plants on, 101
 - Protecting, 107
 - shearing on, 105
 - Value of flock of, 100
 - ranger must own some land, 100
 - Red water in, 319
 - reminders, 97
 - Returns from, 90
 - Romney Marsh or Kent, 117

- Sheep, Ryeland, 118**
 scab, 323
 shear, When to, 95
 shearing by machine, Proper method, 506
 machine, 506
 and hand, 505
 Objections to, 506
 Place for, 505
 Precautions before, 504
 Sweating before, 504
 Time of, 504
 Washing before, 503
 shed, Straw-covered, for, 92,
 Simple foot rot, 318
 Snuffles, 322
 Sore mouth, 321
 Sore throat, 322
 Stomatitis, 321
 Stoppage of bowels, 322
 Shetland, 118
 show, Fitting, for, 96
 Shropshire, 118
 Southdown, 118
 Stomach worm, 324
 Sturdy or Turnsick, 324
 Suffolk, 118
 Tape worm, 325
 Teeth of, indicate age, 315
 ticks, 323
 Tunis, 119
 Types and breeds of, 110
 types, Development of, 110
 U. S., Number in, 120
 Urine, bloody, 319
 Stoppage of, 319
 Variola, 320
 water, need, 93
 Welsh or Welsh Mountain, 119
 Wensleydale, 119
 Winter management of, 92
 wooled, Coarse, 112
 Fine, 112
 Wool type of, 110
 Worms, 324
 Yellows, 321
Shrimps on Atlantic Coast, 185
Silver nitrate, 370
Skimmilk, food values, Comparative, 455
 farm, Using, on the, 455
 Human food, 455
 feeding, 456
 stock, Feeding, 458
 What it is, 440
Skunks, Breeding pens for, 71
 time of, 172
 Cost of keeping, 172
 Feed for, 172
 Management of, 171
 raising a failure, 169
 Removing scent sacs of, 172
Smokehouse, Suitable building for, 498
Snail culture, 180
Snails important in California, 185
 Taste for, 180
Sodium bicarbonate, 370
 hyposulphite, 370
 sulphate, 370
Solution, Saturated, 362
 Normal, 362
Solutions and mixtures, How to make, 361
Sow, brood, Characteristics of, 134
 Length of usefulness, 130
 at farrowing time, 139
 Care of the pregnant, 136
 Spaying the, 381
 Gestation period of, 136
 nursing, Feeding the, 139
 Sows, Age to breed, 136
 dry, Treatment of, 140
 Rations for brood, 141
 nursing pigs, 141
 fattening old, 141
South Devon cattle, 72
Spanish Fly, Powdered, 368
Spaying cow, 380
 females, 377
 mare, 380
 sow, 381
Sponges, Cost and yield of acre of, 186
 cultivated off southern coast, 186
Squab production, Breeding stock for, 231
 squabs, Breeding for, market, 231
 killing, Method of, 237
 Marketing, 237
 Picking, 237
 ready for market, When, 237
 Shipping to market, 238
Stallion, Care during breeding season, 16
 When not in use, 16
 teeth, grown, Number of, 264
 use, When to begin, 15
Stavesacre seeds, 370
Steak, Hamburg, 500
Steer, feeders, Most profitable, 60
Steers preferred to heifers, 66
Stomach tube, Passing the, 386
Strychnin sulphate, 370
Sublimed sulphur, 370
Sugar of lead, 369
Sulphate of magnesium, 368
 soda, 368
Sulphur, 370
Sulphuric acid, 370
Surgical cleanliness, Importance of, 374
Sweet spirits of nitre, 368
Swine plague differs from hog cholera, 401
 Slaughtering, 491
Syringe, Hard rubber, for giving medicine, 365
Tannic acid, 370
Tanning, Farm, 502
Tapping the horse or cow, 387
Tar, Oil of, 370
Tartar Emetic, 370
Thermometer, Testing the, 200
Tongues used for food, 502
Tonic, 372
 and indigestion, 372
 powders, 372
Tracheotomy, 385
Trapnesting requires time, 215
Trap, What and when to, 510
Trephining, 387
Trout breeders, Stock ponds for, 177
 brook, Raising artificially, 177
 Eastern brook, 176
 eggs, Hatching tray for, 177
 Removing dead, 177

- Trout, European brown, 176
 - Time of hatching, 178
 - ponds, Nursery for, 177
 - Rearing for, 177
 - Requirements for, 177
 - raising plant, Plan of, 177
 - spawn, When, 177
 - Stripping a, 177
 - farm should include, 177
 - Feeding, 178
 - Hatching troughs for, 177
 - Western rainbow, 176
- Tuberculin test for cows, 392
 - hogs, 392
 - in eye, 393
 - intradermal method, 392
 - make, How to, 392
 - sub-cutaneous method, 392
 - yearlings, 395
 - used, How, 392
 - What it is, 392
- Tuberculosis, 390
 - Cause of, 390
 - control, American system of, 394
 - Bang method, 394
 - Disinfecting stables, 394
 - European systems, 394
 - Manchester method, 394
 - Ostertag method, 394
 - Well ventilated stables, 395
 - Detecting presence of, 482
 - develops, How it, 391
 - Disinfecting stable, in case of, 395
 - disinfection, Solutions preferred, 395
 - Dr. Koch's discovery, 390
 - Farmers' plan for fighting, 395
 - Losses from, 393
 - Importance of, 393
 - germs differ in cattle and man, 390
 - how killed, 390
 - identify, How to, 392
 - infection, Danger of, from, 393
 - keep it out, How to, 393
 - Nature of, 391
 - propagated by tuberculous cows' milk, 390
 - rid herds of, How to, 393
 - Symptoms of, 391
 - taken, How, 390
 - treatment, Fresh-air, for, 395
 - Testing sputum for, 396
 - What it is, 390
- Tuberculous animals, Separate calves from, 396
 - cattle, Control of, 393
 - Payment for, 394
 - cow, Calf should not be allowed to suck, 395
 - cows, Pasteurizing milk from, 396
- Turpentine, Oil of, 370
- Turtle culture, Conditions for, 185
 - Diamond-back Terrapin culture practicable, 185
- Turtles, Two species of, 185
- Unnerving, 388
- Veal calves, Methods of dressing, 494
 - carcass, Cutting a, 494
 - Dressing, 498
 - Front quarter of, 494
 - Regulations on sale of, 493
- Veals, Shipping, 494
- Venison cheap in Old World, 166
 - producing, Cost of, 167
 - production hampered by law, 166
- Veterinarian, for valuable animals,
- Water, Clean, necessary, 235
 - Farming, 175
 - Fresh, 176
 - Range of, 175
 - What it offers, 175
 - worth while, 175
- Weights and measures, 361
- Whey, Contents of, 441
- White liniment, 372
 - lotion, 373
- Whitewash—Government formula, 373
- Windpipe, Opening the, 385
- Witch Hazel, 370
- Wool, American market grades of, 508
 - and Mohair on the farm, 503
 - Assort when packing, 506
 - condition affecting value, 507
 - farm selling, Methods for, 507
 - free from chaff, should be, 504
 - Grade affects value of, 508
 - Importations of, 120
 - Leading states in, 121
 - Packing frame for, 506
 - Rolling the, fleece, 95
 - sheep, from healthy, best, 504
 - Twine, proper, for tying, 506
 - Tying and packing, 506
 - value of, Character affects, 509
 - To increase, 504
 - Warehouse and Storage Company, National, 507
 - washing unprofitable, 503
- Wools, Burry, less valuable, 504
 - Different ways of selling, 507
 - farm, Factors affecting the value of, 507
 - Selling, 507
 - markets, Principal, for, 507
 - Prices of washed and unwashed, 503
 - Tub washed, 503
- Wound, Sewing a, 376
- Wounds, Barb wire, 376
 - Punctured, 376
 - Stop blood flow in, 375
 - treat, How to, 375
 - treatment, Importance of prompt, 375
- Yeast mixture, 373
- Zinc sulphate, 370

TEXT ILLUSTRATIONS

- Babcock test, Pouring acid, 443
 - Glassware for, 443
 - Mixing, milk and acid, 443
 - Pipette, Using the, 443
 - Reading fat column, 443
- Testers, 444
- Bacon strip properly trimmed, 448
- Bandage to hold poultice, 366
- Bantam, Red Pyle Game, 211
 - White Japanese, 210
 - Buff Cochin, 212
- Barn, Ventilating system in, 50
- Bass, Box nest for, 179
- Beaver, 511
- Beef Animal, Parts of a, 61
 - Carcass, Splitting, 487
 - cattle, Self feeder for, 66
 - cuts named, 488
 - Beef, Sticking and bleeding, 486
 - Skinning face, 486
 - forequarters, 487
 - Prime rib roast of, 488
 - Removing tongue, 496
 - Round cut of, 489
 - Shank for soup bone, 495
 - side, Method of cutting, 488
 - Sirloin cut of, 489
 - steers in U. S., 89
- Belgian hare, 165
- Bison, American, 167
- Bistoury for opening paunch, 385
- Brooder house, Combined colony, 202
 - hover, Metal, 192
- Breeding, Inseminator for artificial, 17
- Bull, dairy, Points of good, 53
 - Milking Shorthorn, 70, 73
 - steer, How to cast, 377
 - Red Polled, 72
 - Reproductive organs of, 386
 - South Devon, 71
- Butchering outfit, Farmer's, 485
- Butter lost in separating, 454
 - temperatures, 454
 - Materials in, 440
 - Packing in prints, 470
 - print mold, 471
 - Salting, 469
 - tub, Wooden, 472
- Buttermilk, Composition of, 440
- Butterworker, Farm, 469, 470
- Calves, How to hold for castrating, 379
- Camas, Death, 101
- Capon and rooster compared, 200
- Casting large animals, Methods of, 377
- Castrating instruments, 378
 - lamb, 381
 - Castrating instruments, pigs, 380
 - "Catalo," 167
 - Catheter, for mare, 386
 - stallion, 386
 - Cattle, Beef and dairy, compared, 78
 - Beef type, 79
 - Dairy type, 79, 80
 - Feeder type, 62, 63
 - prices of, Increased, 88
 - world distribution, 74
 - Cavies, Hutches for, 169
 - Check rein, 10
 - Cheese, American, Types, 474
 - Composition of, 440
 - Draining curd, 475
 - factories, Distribution of, 481
 - factory, Exterior of, 479; plan of, 480
 - press, Farm, 476
 - factory, 477
 - Chicken coop for natural brooding, 192
 - Chicks, Day-old, 192
 - Drinking fountain for, 193, 201
 - How to mark, 200
 - Strong and weak, 198
 - Cholera death rate in Indiana, 401
 - Churn, Types of, 468
 - Chute and stocks for holding animals, 381
 - Clam, Interior structure of, 183
 - digger at work, 185
 - Colony and brooder house, Combined, 202
 - Colt, Breaking a, 25
 - Navel and joint disease in, 271
 - Combs, Single and Rose, 209
 - Cow, Brown Swiss, 81
 - clean, Keeping, 55
 - Dehorning with saw, with shears, 388
 - Dexter, 83
 - Drenching a, 369
 - Dutch Belted, 81
 - filthy, Tie that makes, 55
 - Milking Shorthorn, 70, 73
 - Points of good dairy, 50
 - Red Polled, 72
 - South Devon, 71
 - Temperature of tuberculous, 390
 - Where to tap a, 387
 - Cows, Clean and dirty, 449
 - Clean, are necessary, 451
 - Dairy, in 1910, 88
 - Good and poor, 40, 456
 - Salt brick for, 57
 - Cow's udder, Structure of, 434
 - Coyote in trap, 108
 - Cream, Composition of, 440
 - Ripening vat, 468
 - Separator, 454
 - bowl showing slime, 455

- Cream, Skimming methods, 453
 Creameries, Distribution of, 466
 Creamery, Iowa, 472, 473
 Cuts, wire, Healing, 376
- Dairy barns, Gutters for, 450
 farms, Official score card for, 448
 products, Where obtained, 446
 Dairyman in white suit, 458
 Deer, Virginia or White-tailed, 166
 Dehorning, cow with saw; with shears, 383
 Where to cut in, 382
- Dog, Airedale, 159
 as vermin killer, 157
 Bloodhound, 154
 Coach, 164
 Collie, 159
 German Shepherd (Police), 160
 Great Dane, 164
 How to dose a, 161
 kennel, Home made, 158
 Mastiff, 164
 Newfoundland, 154
 Old English Sheep, 158
 Pointer, 162
 St. Bernard, 154
 Setter, 162
 Spaniel, 163
 terrier, Boston, 164
 Bull, 162
 Irish, 164
 Smooth fox, 164
 Welsh, 164
 Wire-haired fox, 164
 Dog's toenails, Trimming, 360
 Drinking fountain, Home made, 193
 Duck feed, Mixer for, 228
 Ducks, Muscovy, 227
 Pekin, 226
 Rouen, 228
 Runner, 227
- Egg candling box, 196
 Eggs, for hatching, Packed, 199
 crates, Two types of, 205
 from incubator, candled, 195
 How to candle, 196
 laid by hen in 5 years, 206
 Test for fresh, 195
 Ewe, "Galvanized-iron," 106
- Feed hopper, Automatic, 203
 Rat-proof, 203
 truck, Handy, 54
 wagon, 66
 Feeder, Outdoor, poultry, 204
 Feeding crate, Poultry, 203
 shed, Plan of, 68
 Fence, Dog-proof, 92
 Fetus in cow, 384
 Fish eggs, Tweezers for removing dead, 178
 net, Flyke, 181
 food, Plan for increasing supply, 180
 pond, Dam for, 129
 Dike for, 181
 Farm, 176
 Outlet for, 176, 180
 Section of, 178
 Table showing growth of, 178
- Fish Eggs, trap, Wire, 181
 Float, Dental, 382
 Fountains, Elevated, drinking, 201
 for chicks, 200
 Fowl, Crevecoeur, 210
 Hamburg, 210
 hung for picking, 195
 Silky, 211
 Skeleton of, 218
 White crested Black Polish, 212
 Fowls, Animal food in rations for, 193
 Line breeding chart for, 214
 Strong and weak, 138
 Fox, Common red, 170
 den, 170
 farm, Plan of, 171
 Silver black, 170
 Foxes, Home made pen for, 172
- Gag, for use with, Stomach tube, 386
 Glanders, Drinking fountains that spread, 426
 Sanitary hydrants to prevent, 427
 Goat, Angora, 123, 124, 125
 Shearing table for, 126
 Milking stand for, 129
 Nubian, 129, 131
 Saanen, 123, 131
 Teeth of, 325
 Toggenburg, 127, 128
 Goats, Land cleared by Angora, 126
 Milch, Shed for, 130
 Stall for, 130
 Number in world, 122
 Goose, African, 230
 Chinese, 230
 Egyptian, 230
 Embsden, 229
 Toulouse, 229
 Wild, 230
 Guinea Fowl, 458
- Ham, Properly trimmed, 493
 Hay cattle like best, 59
 Hen, Eggs laid by average, 187
 Pelvis of, 216
 Hog carcass, Opening, 492
 Removing tongue from, 502
 viscera from, 494
 cholera, Kidney affected by, 400
 Ulcers on intestines, 400
 feed trough, 139
 house, Central colony, 134, 136
 Scalding a, 492
 Sticking a, 492
 Vaccinating, 404, 405
 Wallow and Combined drinking place, 399
 Hogs, Good quarters for, 403
 Marking systems for, 143
 Poor quarters for, 402
 Self feeder for, 140, 142, 399
 Spraying large, 135
 Horse, Blood and breathing systems of, 265
 Blood worms of, 286
 breathing, Listening to, 266
 Capped hock on, 281
 Clippers for trimming, 9
 Cocked ankle on, 281
 collar, Stretching, 11
 Conformation of legs, 277

- Horse, Curb on, 279**
 Digestive organs of, 263
 Drenching a, 367
 Founder in, 280
 Glanders in a, 424
 grooming, Tools for, 8
 hoofs, Trimming, 11
 Implements for treating split hoof, 283
 joint of, Typical, 263
 Lymphangitis in a, 269
 Parts of the, 278
 Pin worms of, 286
 Quarter crack in, 281
 ration, Bulkiness of, 6
 Ring-bone on, 281
 Round worm of, 285
 Saltbrick for, 7
 scarifying, Knifeblade for, 289
 Shoe boil on, 281
 shoe pad for, Rubber, 12
 Shoes to prevent slipping, 12
 Sidebone on, 282
 Sling for supporting, 269
 Sore throat, Steaming for, 275
 Spavins, 284, 285
 Splints on, 281
 Split hoof on, 282
 How to treat, 283
 Stomach wall with bots, 286
 Stringhalt in the, 279
 Syringe for giving medicine to, 277
 tail rubbing, How to prevent, 289
 Teeth of, at different ages, 264
 Thermometer for taking temperature of, 268
 Thoroughpin on, 285
 Twitch on, 378
 Wind gall on, 285
- Horses, Farm, 14, 15**
 Horse's foot contracted and sound, 282
 perfect, 12
 mouth, Balling iron in, 373
 pulse, Taking, 266
 skeleton, 263
 teeth, Changes in, 264
 Hurdle for fencing sheep, 92
- Incubator Farm, 192**
 Injections, Apparatus for giving, 366
- Lamb carcass as marketed, 490**
 Castrating a, 381
 chops, Types of, 491
 Docking a, 94, 383
 Leg of, untrimmed, 491
 poisoned by loco weed, 320
 side of, Cutting, 491
 ticks on, 322
- Lupine, 102**
- Manger, Common types of concrete, 450**
 Mare and foal, Good and poor, 18
 Mare, Breeding hoppers on, 19
 Reproductive and urinary organs of, 265
 Meat under brine, Keeping, 502
 Milk bottle caps, Types of, 458
 filler, 463
 washer, 462
 Best grade, packed, 465
 can in jacket, 459
- Milk, cans, 459**
 clarifier, 463
 cooler, Farm, 452, 460
 heater for cheesemaking, 478
 Lactometer in use, 444
 Plant, Score card for city, 464, 465
 pail, Three types of, 450
 powder and its product, 441
 record, 56
 sediment tester, 445
 discs from, 445
 seen through a microscope, 435
 scales and record, 56
 tank, Homemade, 455
 wagon, Typical retail, 464
 Whole composition of, 437
 Wrong way to market, 457
- Milking Shorthorn bull, 73**
 cow, 70, 73
 stool, attached, 451
- Mink, 171**
Muskrat, 511
- Needle, Grooved, for locating deep abscess, 385**
Needles, Suture, for wounds, 375
Nests, Trap, under roosts, 215
- Operating table for large animals, 388**
Oven, for dairies, Sterilizing, 461
Oysters grow, How, 184
- Pelts correctly stretched for curing, 512**
Pig, Castrating young, 380
 forceps, 384
 vaccinate, Where to, 404
- Pigs, Guard rail for, 133**
Pigeon, Homer, 236
 house and pens, Side view of, 232
 Plan, 233
 Inside a, 235
 Plan of end of, 234
 nest-boxes, Lower tiers of, 236
 Nursery pen, 237
 Part of barn for, 234
 White Runt, 232, 236, 238
- Pork shoulder properly trimmed, 498**
 Method of cutting side of, 493
- Poultry breeding, chart, 214**
 Dressed and carefully packed, 204
 farms, Distribution of, 217
 feed hoppers, 203
 Feeding crate for fattening, 203
 feeder, Outdoor, self, 204
 Hook for catching, 191
 Killing, by bloodless method, 194
 Sticking, 195
 yards, Double, 188
- Prairie dog and burrows, 108**
- Rabbit, Dutch marked, 165**
 English, 165
 Lop-eared, 165
- Ram, Barbados, 113**
 Dartmoor, 114
 harness for, Marking, 92
 of poor conformation, 91
 Oxford Down, 117
 Right type of, 91
 Red Polled cattle, 72

Reins, Holding in driving, 13
Repeller for aiding parturition, 384
Rooster and capon compared, 200
Roosters of high and low vitality, 200

Sausage casings from animals, 499
Shearing machine, 95
Shed for beef cattle, 64
 to provide shade, 64
Sheep, Barbados, 113
 Black-faced Highland, 113
 Bony framework of, 317
 Brain of giddy, 324
 Cheviot, 114
 Dartmoor ram, 114
 Dipping bag, 324
 Drenching a, 371
 English and Scotch breeds, Home of, 112
 fence, Dogproof, 92
 herder, Basco, 99
 Mexican, and outfit, 100
 How to earmark, 97
 Hurdle for fencing, 92
 hurdles in lambing barn, 93
 in world, 110
 Karakule, 115
 Leicester, 115
 Lip and leg disease on, 319
 Oxford Down, 117
 Points of good, 112
 Range, Ear marks for, 107
 regions in U. S., 120
 scab, Cases of, 323, 324
 shearing, Before and after, 95
 shears, Hand, 95
 Sticking, 489
 Stomach worm, 325
 Suffolk, 118
 Teeth of a, 316
 ticks, 323

Sheep, Trimming hoofs of, 97
 Tunis, 119
 types, Good and bad, 91
 with stomach worm, 325
Shepherd of the early days, A, 98
Sheep's body, Parts of the, 315
 foot with foot-rot, 318
 stomachs, 316
Skimmilk, Composition of, 440
 for laying hens, 456
Skunk, Section across rump of, 172
Skunks, are easily tamed, 172
 Box for raising, 172
Smokehouse, Farm, 498
South Devon cattle, 71
Sprouting grain, Rack for, 193
Squabs, Pair of White Runt, 231
Stallion, Poor type of, 16
Sterilizing oven for dairies, 461
Sutures used in surgery, 376
Syringe, Hypodermic, 365
 Medicine, 277

Thermo-cautery for firing, 383
Tourniquet in place, 374
Trachea tube in place, 385
Trapnest, Side view of, 215
Trapnests under roosts, 215
Traps for farmers' use, 510
Trepine, One form of, 388
Trocar and canula, 273
Tubercles on cow's stomach, 392
Tuberculin, Injecting, into pig's ear, 394
 test intradermal method, 393
 reactions, 393, 394
Tuberculous nodules, Cow's liver with, 391

Whey, Composition of, 441
Wolf, Gray, 510
Wool, How to open fleece, 508

APPENDIX

Capons and Caponizing on the Farm

(SEE CHAPTERS 18 AND 19)

A CAPON is a rooster or cockerel castrated (p. 377) while quite young and so fed and cared for as to develop extra size, weight and quality of meat. In addition to usually being of larger size than the ordinary fowl, it shows undeveloped comb and wattles (Fig. 233) and lacks male characteristics such as the ability or at least the tendency to crow, the desire to fight, a stately, erect gait and carriage, etc. At the same time the plumage becomes heavy and glossy and the hackle, saddle and tail feathers grow unusually long. Among market poultry capons are classed as special luxuries and sell for fancy prices, often for twice as much, per pound, as ordinary roosters. Nevertheless markets in which a demand has been established, as is the case in practically all large cities, are rarely if ever over supplied.



FIG. 615. A cockerel of proper caponizing size: weight $1\frac{1}{2}$ to 2 pounds; age 8 to 12 weeks

Advantages of caponizing. Whether it will pay a farmer or poultryman to specialize in capon production is a question that can be answered only from a knowledge of conditions in any particular case; sometimes experience alone will tell. But, where the necessary time and attention can be given, where the farmer is prepared to operate carefully and at just the right stage in the birds' growth, and where a considerable number of surplus cockerels of one of the larger breeds is available, there is a good chance that these birds can be marketed more profitably as capons than as broilers or ordinary "fowl."

Breeding purposes aside, a capon exhibits the following advantages over a rooster as a member of a flock: It is quieter, more docile and neither fights nor bothers the other birds; it stands close confinement and heavy feeding better; it puts on flesh more rapidly, and also more economically because more of the food consumed is turned into meat and less into wasted energy; it can be held and fed longer without risk as it simply continues to grow without ever becoming coarse or "staggy"; and, as already pointed out, it is worth more, pound for pound, because its meat is more tender and delicious. Of course, there is a point beyond which it becomes unprofitable to feed capons because the rate of growth does not remain sufficient to more than cover the cost of the feed required to produce it, but this is not reached as soon with capons as with other poultry.

Other poultry.

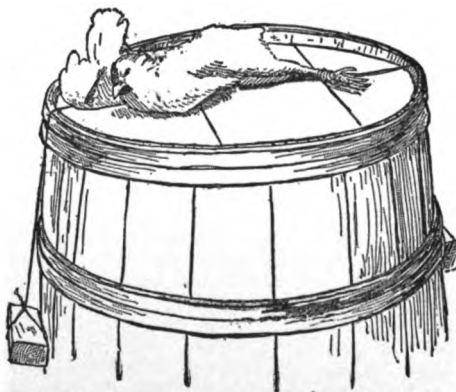


FIG. 616. Barrel table for caponizing. The weighted cords from legs and wings should run through grooves or holes. (Fig. 615 and this from Bul. 226, Md. Exp. Sta.)

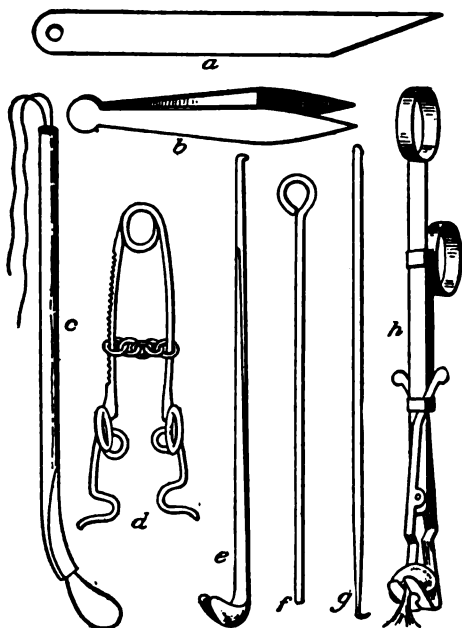


FIG. 617. Caponizing instruments (see text). One type of adjustable spring spread is shown at *d*, and a slide forceps at *h*.

The best capon breeds. The large, meat breeds naturally produce the largest, highest priced capon carcasses, some of which weigh as much as 15 pounds at 10 months of age. There is often, however, a larger demand for a somewhat smaller bird better suited to the needs and kitchen equipment of a small family. The small, active egg breeds are the least suited to capon production, though a caponized cockerel of any breed or variety will exhibit to some extent the changes and increased growth mentioned above. Males from the average, general purpose farm flock usually give good results, especially if they carry a little blood of one of the standard medium to large breeds. Black pin feathers are an undesirable feature that should be avoided if possible in choosing a variety.

Requirements for caponizing. Except that it is more difficult to operate on small birds in which the organs are less developed, the earlier the caponizing can be done the better. The usual time is when the cockerels are from 2 to 3 months old and weigh from 2 to 2½ pounds. Average intelligence, a steady hand and good eye, a good set of instruments, strong light, reasonable care, and some little practice are the few and relatively simple requisites for successful work. If possible the prospective caponizer should watch an expert operator carefully before he attempts the operation; in any case he should practise upon a number of dead birds, beginning with

fairly large ones, until he becomes familiar with the details of the work. At first he should not expect to take less than 15 minutes in castrating one bird; later 5 minutes should be sufficient. After a little practise the losses should not exceed 5 per cent of the birds caponized; with the expert they rarely reach 2 or 3 per cent.

The necessary instruments (see Fig. 617) are a scalpel (*a*) or very sharp knife for cutting the skin, a sharp pointed hook (*g*), a spreader for keeping the wound open (*d*), a probe (*f*), a canula (*c*) or spoon forceps (*e*), and, preferably, a pair of tweezers (*b*). These can be bought separately but it is advisable to get a complete standard set, of good steel and workmanship, with which are usually supplied full and detailed directions.

Preparatory steps. The birds to be caponized should be kept without food or water for at least 24 hours previous to the operation; 48 hours is not considered too long by some operators. The work can be done wherever there is strong, unobstructed light, sunlight being best of all. If the weather permits, a location outdoors sheltered from the wind is excellent. Of course the more experienced the operator the less necessary is a strict adherence to these requirements.

There should be prepared clean coops or pens for the birds both before and after being operated upon. Also a table of convenient height (a barrel will do in a pinch) and close at hand a support for the instruments, a dish of water containing a disinfectant, a small sponge, and some antiseptic cotton. The table or barrel top should be fitted with cord loops running through holes in such position that they can be placed over the legs and wings

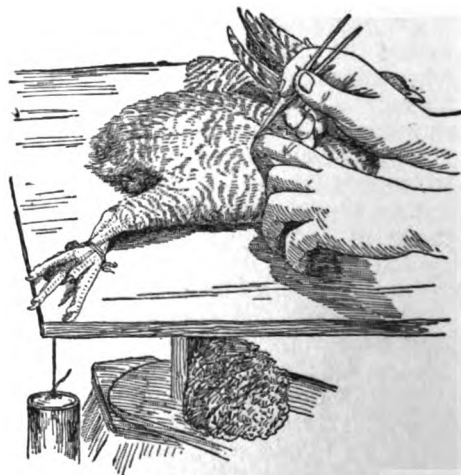


FIG. 618. Locating the point at which to make incision. Note cord carried through hole in table top; also shelf below for instruments, sponge, cotton, etc.

of the bird; weights should be fastened to the free ends of the cords underneath so that the loops will be pulled taut and hold the bird quiet in the desired position.

How to caponize. The incision or opening into the body cavity is made between the last two ribs (which can easily be located by passing the fingers along the side of the bird) and should be about an inch long. The more skilful the operator the smaller the opening through which he can work. First spread the feathers apart over the spot where the cut is to be made, remove a few along the actual course of the incision, and moisten those surrounding it so they will lie flat. Next stretch the outer skin as far as possible toward the rear so that when the operation is over it will slip back and the openings in the outer and inner skin will not come exactly on top of one another. Then make one clean cut with the scalpel, opening the body cavity. If the bird has been kept without food for some time, the intestines will be empty and collapsed and well out of the way so that danger of cutting them will be slight.

Now insert the spreader between the lips of the wound and also the ribs, so as to keep them apart; some spreaders are made on a spring principle, others are adjustable permitting the opening to be made large or small according to the requirements of the operator. This done tear open with the sharp pointed hook the thin membrane (*omentum*) that covers the intestines; it is not safe to attempt this with the scalpel for fear of cutting the intestines. Next move the mass of intestines away from the backbone with the probe and one of the two glands or organs (testicles) that are to be removed will be seen close up against the backbone. It is of a creamy yellow color, about the shape of a navy bean, and ranges in size from that of a grain of wheat in a very small bird to that of a bean in a nearly mature cockerel.

Grasp the gland with the loop of the canula or with the spoon forceps, twist it around several times and remove it, breaking the cord by which it is attached. In doing this take special care not to puncture the large blood vessel lying just back of the gland, for if this is done the bird is practically certain to bleed to death. This accident is probably responsible for the majority of losses experienced in caponizing.

After removing one gland delicately mop up any blood clots with a bit of cotton held in the tweezers, let the intestines fall back into place, remove the spreader and let the skin slip back over the wound. Then turn the bird over and repeat the operation on the other side to remove the second testicle. This is the safest course for the beginner, but the expert usually removes both glands from one side, through one incision, which is, of course, desirable in that it saves time and renders the second cutting unnecessary. In doing this, the lower testicle should be removed first so that it will not be obscured by any bleeding that may occur.

Cautions. While the operation is thus a very simple one to perform, it is nevertheless a surgical operation and all possible precautions should be taken against excessively deranging the internal organs, making an

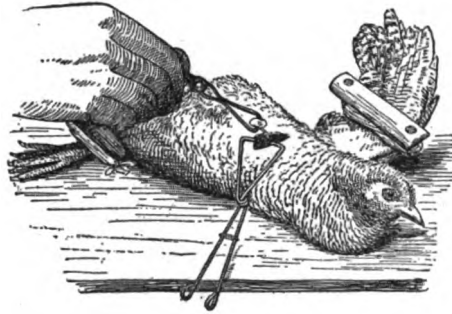


FIG. 619. Removing testicle with forceps. Note type of spreader used, also wooden clamps instead of cord loops for holding legs and wings.



FIG. 620. Enlarged view of opening as shown in Fig. 619. Testicle is being removed with spoon forceps.

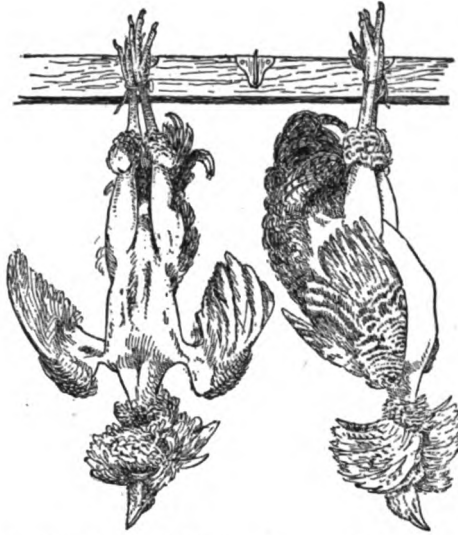


FIG. 621. Front and side views of capons showing characteristic method of dressing.

unnecessarily large opening, or infecting the wound. Needless to say the hands and instruments should be scrupulously clean at all times. Some losses must, of course, be expected, especially at first; however, birds killed by mistake during the operation are perfectly good for the table and may be eaten rather than destroyed and wasted.

Sometimes a small portion of a gland is left in the body, in which case the bird partially develops male characteristics and becomes a sort of freak known as a "slip" which is useful as neither capon nor rooster. Such birds are best destroyed as soon as discovered.

After treatment of capons. After being caponized birds should be placed in a clean pen, given plenty of water, and gradually supplied with a little soft food. Keep up this special treatment and

watch them carefully for three or four days after which, if no signs of trouble have appeared, they are ordinarily able to receive their regular ration and run with the other fowl. Sometimes slight local bloating will occur as the result of air getting in under the outer skin, but this is not serious and can be promptly and effectively relieved by puncturing the wind puff with a sterilized needle.

Feed capons generously and, about three weeks before marketing them, put them through a course of fattening if possible. At this time they can be confined even more closely than before, but if so handled their quarters must carefully be kept clean. The aim should be to develop the plumpest, largest carcass possible—the best capon is always the fattest.

Marketing. Average figures for the cost of raising a capon to market size—which can usually be done in from 10 to 12 months—vary from 80 cents to \$1.25 or more depending on the cost of feed, the price of labor, etc. But with 30 cents a pound, no more than a moderate price for a high class product, a 10-pound capon will usually show a good profit.

It is customary to market capons with head and hackle feathers on, also those of the wings as far as the second joint, and those of the tail extending a short distance along the back. This style of dressing serves to distinguish them from other market fowl, although their plumpness and size are usually equally characteristic. Of course a private trade in which the customer desires birds dressed ready for cooking, or the practice of selling alive to a wholesaler or buyer, render this extra trouble unnecessary. Directions for killing, plumping, and packing capons are the same as for other sorts of poultry (see p. 194).

FEB -- 1990

FEB -- 1990

